PB81-190027

Identification and Listing of Hazardous Waste Under RCRA (Resource Conservation and Recovery Act), Subtitle C, Section 3001; Fate and Transport of Hazardous Constituents (40 CFR 261)

(U.S.) Environmental Protection Agency
Washington, DC

May 80

U.S. Department of Commerce
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BACKGROUND DOCUMENT

IDENTIFICATION AND LISTING OF HAZARDOUS WASTE UNDER RCRA, SUBTITLE C, SECTION 3001

Fate and Transport of Hazardous Constituents
(40 CFR 261)

This document (ms. 1941.30) provides background information
and support for EPA's hazardous waste regulations

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May 1980

Preface

This appendix is divided into two sections. The first section is a compilation of the physical and chemical properties of 195 hazardous constituents, many of which are included as the constituents of concern in the hazardous waste listings promulgated (interim final) today (see Appendix VII of Part 261 of the regulations). The second section provides estimates of the migratory potential/persistence of the constituents of concern based on a "model" in which the waste is disposed of in unconfined landfills and/or lagoons (i.e., estimate the potential release rates of the hazardous constituents to assess the magnitude of its potential to contaminate groundwater and surface water and present a potential problem to human health or the environment). This data was compiled and prepared for the Office of Solid Waste (OSW) by the Environmental Research Laboratory (Athens, Georgia)/ U.S. Environmental Protection Agency.

Section I - Physical and Chemical Properties of Hazardous Constituents

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This document is one of a series providing support for regulations issued by the U.S. Environmental Protection Agency (EPA) under Subtitle C of the Resource Conservation and Recovery Act (RCRA). The regulations represent the initial effort for nationwide control of hazardous waste from point of generation, through transportation, treatment, and storage, to point of ultimate disposal.

This appendix is divided into two sections. The first is a compilation of the physical and chemical properties of 195 hazardous constituents, many of which are included as the constituents of concern in lists of hazardous waste in the regulations. The second section provides estimates of the migratory potential/persistence of the co-nstituents of concern based on a "mddel" in which the waste is disposed of in unconfined landfills and/or lagoons.

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A. INTRODUCTION

This section of the appendix provides the physical and chemical properties of 195 hazardous constituents, many of which are included as the constituents of concern in the hazardous waste listings promulgated (interim final) today. The major physical and chemical properties included in this appendix are:

Physical Properties - molecular weights, vapor pressures and solubilities

Chemical Properties - octanol-water partition coefficients, hydrolysis rate, photolysis rate, biodegradation rate, volitilization rate, oxidation rate and air chemistry rate.

B. METHODOLOGY AND LITERATURE DOCUMENTATION*

Physical Properties

Molecular weights, vapor pressures, and solubilites generally were obtained from the Chemistry Handbook (1975) and Verschueren (1977) although for some compounds it was necessary to refer also to the Herbicide Handbook (1979), Martin (1971), or Spencer (1973). The calculated solubilites were obtained from the calculated value of K_{OW} (see below) and the following expression derived from Chiou et al. (1977)

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*This information was taken from a memo sent to Dr. James Falco, Environmental Research Laboratory/U.S. EPA from Dr. Dale G. Hendry, Senior Organic Chemist, SRI International, dated March 14, 1980.

$$\log S = 7.5 - 1.5 \log K_{OW}$$

where S is the value for water solubility in μmoles/liter. This method for estimating solubility appears reliable for many compounds but has not been widely tested.

The Chemical Abstract CAS numbers were obtained from Dialog computerized listing of Chemical Abstracts data by entering the chemical name. In most cases the CAS numbers are unique to the chemical; however, isomers and their mixtures generally will have different numbers. No attempt was made to list more than one CAS number.

Octanol-Water Partition Coefficients (K_{OW})

Values of K_{OW} were calculated using a computer routine developed at SRI by Johnson and Leibrand (1980) which uses group values reported by Hansch and Leo (1979). In some cases the computed values are designated as approximate by the routine because either data is missing for one or more groups or the compound is suspected of being susceptible to polar interactions with water. In the first case, the value of K_{OW} is considered to be unreliable and generally dropped. In the second case the value is manually corrected if possible. In both cases, values reported are labeled with "P" to denote that the input data was only partially complete.

Hydrolysis Rate Constant (K_H)

Rate constants for hydrolysis of chemicals evaluated in this assessment were taken in part from a review by Mabey and Mill (1978); data for other chemicals were obtained from the personal files of T. Mill or W. Mabey. In some cases, hydrolysis data were estimated by analogy to other chemicals of known reactivity with similar structural groups. For chemicals that have pH dependent hydrolysis rates, hydrolysis data are usually given for the slowest hydrolysis rate that may be expected for environmental pH values of 4 to 9. Most rate constants are accurate to within an order of magnitude, which is small in comparison to the pH dependence of some chemicals where the hydrolysis rates will vary by an order of magnitude for each unit change of pH.

The observed rate constants are expressed as a first order constant (K_H in units of hr^{-1}) and is related to the neutral, acid and base promoted rate constants as follows:

$$k_H = k_n + k_a [H^+] + k_b [OH^-]$$

Photolysis Rate Constants (k_p)

This assessment evaluted the photolysis of chemicals in aquatic systems, and focused primarily on direct photolysis processes; for the few examples where photolyses was reported in natural waters, the observed half-lives were used to estimate the rate constants. The half-life (t 1/2) was converted to the apparent first order rate constant by the expression $b_p = (\ln 2)/t\ 1/2$. Compounds which we knew or judged to have no significant light absorption above the solar cutoff (about 290 mm) were considered to be stable in sunlight. Literature data were available only for a few chemicals. Data for other chemicals were estimated by analogy to chemicals having similar structural groups and absorption spectra. No single source of photochemical data was found to be useful for this assessment, but rather the personal files of T. Mill and W. Mabey were used. These files were accumulated in laboratory and literature studies performed for numerous past projects at SRI. In general, most of the data are accurate to within an order of magnitude, but probably to not better than a factor of two.

Biodegradation Rate Constants (k_B)

The biodegradation rates in the aquatic systems depend on types and numbers of microorganisms present, amounts of dissolved oxygen, organic and inorganic nutrients present, and other environmental conditions such as temperature, pH, and light. The variation in any of these factors will affect the environmental degradation rate of a chemical.

Most biodegradation studies are mainly qualitative and are designed to determine whether biodegradation takes place, to isolate active microorganisms, or to study the metabolic pathways. The experimental conditions generally involve use of high chemical concentrations and high cell populations; in some cases the organisms may be from pure cultures while in others they may be from sewage sludge.

Thus translation of rate data from these types of experiments to conditions in neutral waters is not directly applicable. Some biodegradation rate constants reported here were calcualted from estimates of environmental half-lives using data on the relative ease of biodegradation judged from data obtained in river water biodegradation studies or with high cell populations such as sewage sludge studies or soil biodegradation tests. These compounds that are involved in metabolic pathways are assumed to readily biodegrade. Some biodegradability estimations were also made from the chemical structure according to the discussion of Pitters (1974), Alexander (1973), and Howard et al. (1975). For chemicals where evidence indicates an acclimation period prior to degradation, estimates of the acclimation period were made and included with the data. However, the acclimation may be expected to vary widely depending on the environmental conditions. Acclimation is not expected to be necessary for compounds that are continually being introduced into a stream or lake.

Finally, it was assumed that the chemical concentration levels are in range of 1 ppm, so that there are no toxic effects on mircoorganisms nor significant increases of microbial population resulting from the consumption of the chemical.

Volatilization Rate Constants (k_V)

The volatilization rates of these chemicals were estimated from Figure 1 (Smith et al. (1979)) which relates the half-lives for volatilization [$(\ln 2)/k_V$)] to the Henry's Law Constant (H_C) for a variety of compounds. In this case, the calculated values of K_V are given are for a stream. The values of H_C were estimated from the data for water solubility and the vapor pressure of the pure compound at 25°C by the expression

$$H_C = \frac{\text{vapor pressure (torr)}}{\text{water solubility (molar)}}$$

Oxidation Rate Constants (k_{OX})

The rate constants for oxidation of compounds were estimated by analogy with measured values for similar compounds using the relation

$$K_{OX} = K_{RO_2} \cdot [RO_2 \cdot] = K_{{}^1O_2} [{}^1O_2]$$

where K_{OX} is apparent first-order environmental rate constant and $K_{RO_2 \cdot}$ and $K_{{}^1O_2}$ are second-order rate constants for reaction with $RO_2\cdot$ and singlet oxygen (${}^1O_2$), respectively. Environmental concentrations of $RO_2\cdot$ and ${}^1O_2$ used in the calculation were 1×10^{-9} M and 1×10^{-12} M, respectively, based on estimates of Mill et al. (1980) and Zepp et al. (1979).

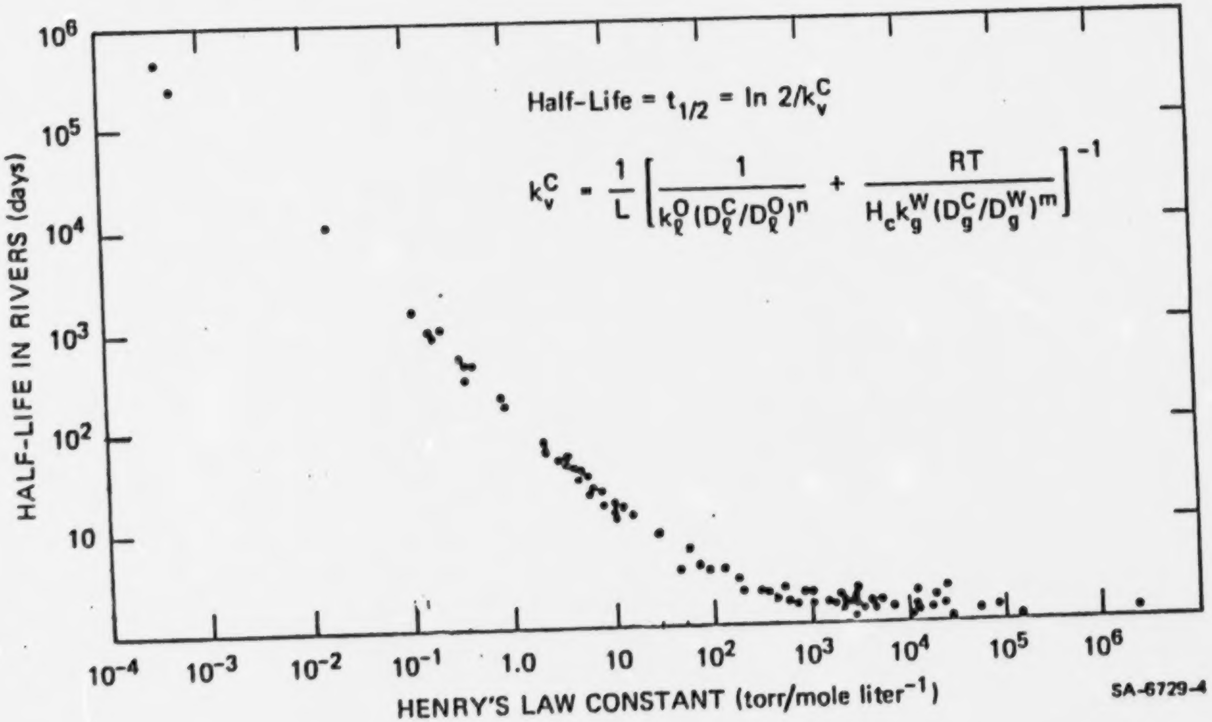

FIGURE 1 ESTIMATED HALF-LIVES VERSUS HENRY'S CONSTANT FOR THE PRIORITY POLLUTANTS IN RIVERS

(Values used: L = 200 cm, k_ℓ^O = 8.0 cm hr^{-1}, k_g^W = 2100 cm hr^{-1}, n = m = 0.7)

Air Chemistry Rate Constants

The importance of the three basic atmospheric pathways - reactions with OH and O_3 and photolysis - were evaluated as described in Hendry and Kenley (1979). The environmental rate constants (k_{OH}) for reaction with OH were estimated from bimolecular rate constants (K_{OH}'') according to the expression

$$K_{OH} = K_{OH}'' [OH]$$

where [OH] is assigned an average value of 1×10^5 radicals/cc (Hendry and Kenley, 1979). Values of K_{OH}'' not available in Hendry and Kenley (1979) were searched for in Atkinson et al. (1979). In the event that no data were found, estimation procedures in Hendry and Kenley (1979) were used to evaluate K_{OH}''.

The environmental rate constants (K_{O_3}) for reaction with ozone were estimated from bimolecular rate constants (K''_{O_3}) using the expression

$$K_{O_3} = K''_{O_3} [O_3]$$

where $[O_3]$ is assigned an average value of 1×10^{12} molecules/cc (Hendry and Kenley), 1979).

The photolysis rate constants were estimated by integrating the absorption spectrum (λ) in the solar region and the quantum yields (ϕ) for photolysis in the presence of air with the solar intensities (J'_λ).

$$k_p = \phi \, \varepsilon_\lambda J'_\lambda$$

Since the quantum yields were generally not known but cannot be greater than unity, an upper limit for photolyis was obtained from integration of absorption spectra with the solar intensities accordingly

$$k_p \leq \varepsilon_\lambda J'_\lambda$$

DATA SHEETS

All data compiled for this report are summarized in the following two tables (see Attachment 1 to this section for the completed data sheets for the hazardous constituents). The format for listing both the chemical processes in the water and air phases has been to give the rate constant for the fastest process in each phase and to list that process. The notation used to indicate the processes is: H = hydrolysis, P = photolysis, O = oxidation, B = biodegradation, V = volatilization, OH = OH radical reaction, and O_3 = O_3 reaction. When other processes are almost as fast, they have been listed following the primary process, although the rate constant has not generally been given. Because volatilization is not a chemical transformation, it is also listed and the rate constant given following the chemical transformation process. This is the case even if volatilization is faster than the chemical transformation.

Rate constants with no letter immediately following were obtained for that specific compound and the reference is indicated following the process by a reference number. Rate constants followed by "A", are for compounds with analogous structures and the reference number is given following the process. Rate constants followed by "E" were estimated upon comparison of a variety of compounds. Generally these values are not referenced.

X

TABLE 1

NAME	CAS	MW	VP(°C), torr	SOLUBILITY, PPM(°C)		log K_{ow}	WATER CHEM		AIR CHEM	
				Obs	Calc		k,hr^{-1}	Process	k,hr^{-1}	Process
Acetonitrile	75-05-8	41.05	74(20)	misc	>1.M	-0.38	3×10^{-2}E (20d acc)	B(37)/V (43)	5.2×10^{-4}E	OH
Acrylamide	79-06-1	71.08	2(87)	misc	>1.M	-0.99	0.03 (33d acc)	B(37)	2.8×10^{-2}E	OH/O_3
Acrylic Acid	79-10-7	72.06	3.2(20)	misc	>1M	0.13	< 3×10^{-2}E (20d acc)	B(36,37)	2.8×10^{-2}E	OH/O_3
Ammonium Methacrylate (C1)	16325-47-6		low	high	>1M	-3.64	0.006E	B(37)	3×10^{-2} E	OH/O_3
Atrazine	1912-24-9	215.7	3×10^{-7} (20)	33(25)			8×10^{-5}E	B(44)	~ 0.10 E	OH
Benzyl Chloride	100-44-7	126.6	1(22)		$3X10^{-3}$M	2.63	~ 5×10^{-2}	H (22)	1.8×10^{-2}A	OH (16)
Bicycloheptadiene		92.1			0.03M	1.98	/ 6×10^{-3}A	No chem/ V(43,C2, C3)	0.2A	OH/O_3(16)
Chloral (C4)	75-87-6	147.4	35(20)		0.2M	-1.41P	< 1×10^{-3}E	B	< 0.067 A	OH/P (16)
Chloroacetaldehyde	107-20-0	78.5			>1M	0.3P	~ 1×10^{-3}E	B	0.06 A	OH/P (16)
Chloroaniline	106-47-8	127.6	1.5×10^{-2} (20)		$8X10^{-3}$M	2.39P	4×10^{-3}A	O (5)	~ 1.2×10^{-2} A	OH (16)
Chlorodene		338.9	1×10^{-5} (25)	~ 1.85	$2X10^{-7}$M	5.5	2×10^{-3}E / 2×10^{-3}A	B/V(32)	0.2 A	OH/O_3 (16)

TABLE 1 (continued)

NAME	CAS	MW	VP(°C), torr	SOLUBILITY, PPM(°C)		log K_{ow}	WATER CHEM		AIR CHEM	
				Obs	Calc		k,hr^{-1}	Process	k,hr^{-1}	Process
Chlorophenol		128.6			1x10^{-3}M	2.94P	3x10^{-3}A/ 2x10^{-3}E	0(6)/ B(37)	<1x10^{-2}A	OH (16)
othro-	95-49-8		10(43.20)							
meta-										
para-	106-48-9		1(49.8)							
2,6-Dichlorophenol	87-65-0	163.0			1x10^{-4}	3.66P	1.4x10^{-2}A	O(17)/P(35)	<1x10^{-2}A	OH (16)
2,4-Dichlorophenoxyacetic acid		221.1		900(RT)	6x10^{-4}	3.15P	1 x 10^{-3}E	B(37) P(38)	1x10^{-3}E	OH
Dicyclopentadiene	77-73-6	132.2	10(47.6)		6x10^{-4}	3.14	6x10^{-3}	Nc chem/ V(C2,C3)	0.25 A	OH/O_3(16)
Syn-Dimethylurea	96-31-1	88.11		> 5x10^4	>1M	-0.52	~ 2x10^{-3} E	B	0.08 E	OH
Dinitrobenzene		168.1		469	0.1M	1.62		None	0.03 E	P?
meta-	99-65-0									
para-	100-25-4									
Ethyl acrylate	140-88-5	100.1	29(20)	2x10^4	0.9M	1.01	~ 1x10^{-2} E	B(36,37)	0.1 A	OH (16)
Ethylene diamine (C4)	107-15-3	60.1	9(20)		>1M	-1.20	6x10^{-3} E (28d acc)	B(37)	~ 0.08 A	ȮH (3)
Ethylenethiourea	96-45-7			(2x10^3)			~ 2x10^{-3}	P(29)	~ 0.08 E	OH
Ferbam	14484-64-1	416.		130			> 4x10^{-3} E	H(C5)		ionic
Furan	110-00-9	68.1	758(31)	1x10^4	0.3M	1.34	0.4A/0.03	O(43,23) /V	0.05A	OH (16)

TABLE 1 (continued)

NAME	CAS	MW	VP(°C), torr	SOLUBILITY, PPM(°C)		log K_{ow}	WATER CHEM		AIR CHEM	
				Obs	Calc		k,hr^{-1}	Process	k,hr^{-1}	Process
Hexachloro-1, 3-cyclopentadiene		273	0.08(25)		$3x10^{-5}$M	3.99	$2x10^{-3}$/ $2x10^{-3}$A	H(42)/V (37)	~ .03 A	OH (16)
Hexachlorodibenzo-p-dioxin							< $8x10^{-5}$	No Rx	< 0.01 E	OH
Hexachlorophene	70-30-4				$1x10^{-11}$M	8.83P	$1x10^{-2}$A	O(17)	< $1x10^{-2}$A	OH (16)
HF	7664-39-3	20.0					instantly	ionizes		rainout
Malathion	121-75-5	330.35	4x10-5 (25)	145		—	$1x10^{-2}$E/ $7x10^{-3}$	B(11,27) /H(38)	$1x10^{-2}$E	OH
Maneb	12427-38-2	265.3		slightly			> $4x10^{-3}$ E	H(C5)		ionic
Methacrylonitrile	126-98-7	67.09	65(25)	$2.5x10^{4}$	>1M	0.24	$3x10^{-2}$ E (after acc)	B(37)/V (43)	0.2 A	OH/O_3(16)
Methanol	67-56-1	32.04	100(21)	misc	>1M	-0.75	.03E	B(15,37) /V(43)	$3.4x10^{-3}$	OH (16)
Methyl Methacrylate	80-62-6	100.11	28(20)		>1M	0.79	$6x10^{-3}$ E (20d acc)	B(37)/V	0.2 A	OH/O_3 (16)
Methyl parathion	298-00-0	263	$0.97x10^{-5}$ (20)	50(25)			~ 0.02E	B(11,31)	< $6x10^{-4}$ E	OH/P ?
Methylstyrene	1319-73-9	118.2	2.3(20)		$3X10^{-4}$M	3.33	$1x10^{-3}$E/ $7x10^{-3}$	B/V(43)	0.3	OH/O_3 (16)

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TABLE 1 (continued)

NAME	CAS	MW	VP(°C), torr	SOLUBILITY, PPM(°C)		log K_{ow}	WATER CHEM		AIR CHEM	
				Obs	Calc		k,hr^{-1}	Process	k,hr^{-1}	Process
Mononitrobenzene	98-95-3	123	.15(RT)	2000	0.05M	1.85	5x10^{-4}E/ 2x10^{-2}A	B(37,28) /V(43,C2)	< 0.01 E	P?
Nabam	142-59-6	256		2x10^{4}			> 4x10^{-3} E	H(C6)		ionic
Nicotinonitrile		104.1			>1M	+0.21	6x10^{-3} E	B(37,C6)	~5x10^{-3}A	OH (16)
N-Nitro-di-n-propylamine		146.1			>1M	-0.20	2x10^{-3} E	P	> 2x10^{-3} E	P
Nitrofuran	27194-24-7	113.1	0.2(25)		0.6M	1.11	2x10^{-3} E	P	~4x10^{-3}A	OH (16)/P
Nitrotoluene		137.1			4x10^{-3}M	2.34	1x10^{-3} / 6x10^{-3}E	B/P(C7)/ V(37)	~1x10^{-3} A	OH(16)/P?
ortho-	88-72-2		0.1(20)	652(30)						
meta-	99-08-1		0.25(25)	498(30)						
para-	99-99-0		0.1(20)	442(32)						
Paraldehyde	123-63-7	132.2	25.3(20)	1.2x10^{5}	0.5M	1.15	1x10^{-3}E/ 3x10^{-3}E	B(15,36) /V(43,37)	~0.06 A	OH (3)
Parathion	56-38-2	291	3.78x10^{-5} (20)	24(25)			4x10^{-3}E	B(11,40)	< 6x10^{-4} E	OH/P ?
Phthalic anhydride	85-44-9	148.12	2x10^{-4}(20)	6	>1M	0.16	1x10^{-3}E/ 4x10^{-3}E	B(36)/ V(37)	7x10^{-4}A	OH (16)
Pyridine	110-86-1	79.1	14(20)	misc	>1M	0.66	3x10^{-2} E (6d acc)	B (37)	~5x10^{-3}A	OH$^{(16)}$
Succinonitrile	110-61-2	80.09	6(125)	1.3x10^{5}	>1M	-0.80	4x10^{-3}E	B(37)	1x10^{-3}A	OH (16)
2,4,5-T	93-76-5	255.49	< .01(20)	278	5x10^{-5}M	3.86 P	2x10^{-3}	P(9)/V	~1.4x10$^{-3}_{E}$	OH
and 2,4,5-Trichlorophenol		197.46	~0.1(25)	2x10^{3}	1x10^{-3}M	4.37P	2x10^{-3}E	V(43)/0	1.2x10$^{-2}_{E}$	OH

[d] Ortho compound only

TABLE 1 (concluded)

NAME	CAS	MW	VP(°C), torr	SOLUBILITY, PPM(°C)		log K_{ow}	WATER CHEM		AIR CHEM	
				Obs	Calc		k,hr^{-1}	Process	k,hr^{-1}	Process
Tetrahydrofuran	109-99-9	72.	176(25)	misc	~1M	0.46	/ $3x10^{-3}$ E	No chem/ V (37)	0.05	OH (16)
Trichlorocyclo-pentadiene					$6x10^{-3}$M	2.48		No chem/ V ?	~0.04 A	OH (16)
See 199										
Trifluralin		335.	$1.99x10^{-4}$ (29.5)	1(27)	$2x10^{-3}$M	4.15P	< $6x10^{-5}$ / $9x10^{-4}$E	P(8)/ V(32)	0.1 E	OH
Trimethylphosphate	512-56-1	140.	1(26)		>1M	-0.52	$3x10^{-4}$ / $3x10^{-3}$E	H(22)/V (37,C2)	$3.6x10^{-4}$	OH
Trinitrobenzene	99-35-4	213		350	0.3M	1.37	/2x 10^{-3}E	No chem/ V (31)	< 0.01	P ?
m-Xylene		106.16	6(20)	130	$2x10^{-4}$	3.46	$2x10^{-3}$E/ $3x10^{-2}$E	B(21,37) /V(43)	0.07	OH
p-Xylene		106.16	6.5(20)	198	$2x10^{-4}$	3.46	$2x10^{-3}$ E / $3x10^{-2}$ E	B(21,37) /V(43)	0.04	OH
Zineb	12122-67-7	275.7		10(RT)			> $4x10^{-3}$ E	H(C5)		

TABLE 2

NAME	CAS	MW	VP(°C), torr	SOLUBILITY, PPM(°C)		log K_{ow}	WATER CHEM		AIR CHEM	
				Obs	Calc		k,hr^{-1}	Process	k,hr^{-1}	Process
Acetophenone	98-86-2	120	0.3(RT)		0.1/.2M	1.59	$4x10^{-3}$E	B(37)/P /V	1.0x10^{-3}A	OH(16)/P?
Acetyl alachlor	structure unknown							B		
Acetyl chloride	75-36-5	78.5	150(RT)		>1M	-1.1P	$2x10^{2}$E	H	5.2x10^{-4}A	OH(16)
Alachlor	15972-60-8	269.8	2.2x10^{-5} (25)	242			< $8x10^{-5}$E	B (44	3.6x10^{-2}A	OH
Ammonia	7664-41-7	17					$1x10^{-2}$ E	B(33)	2.8x10^{-3}A	OH
Ammonium acetate	631-61-8	77					$3x10^{-2}$ E	B(37,C8)		ionic
Ammonium sulfate	7783-20-2	132.1					$1x10^{-2}$ E	B (33)		ionic
Aromatic amines (aniline)	62-53-3	93.12	0.5(RT)	3.4x10^{4}	> 1 M	0.91	$3x10^{-2}$A/ 1.4x10^{-2}E	0(5)/B(2	9.0x10^{-2}A	OH
Benzoic acid, 2-chloro-4-nitro	99-60-5	201.57			$6x10^{-3}$	2.46P	< $3x10^{-4}$E	B.	< 0.03 E	P?
Benzoic acid, 4-chloro-3-nitro	96-99-1	201.57			$6x10^{-3}$	2.46P	< $3x10^{-4}$E	B	< 0.03 E	P?
Benzoic acid, p-chloro,sodium salt	3686-66-6				>1M	-1.51P	1.4x10^{-3}E	B(2,37)		ionic
Benzotrichloride	98-07-7	195.48			$3x10^{-5}$ M	4.03	$1x10^{2}$	H (22)		OH (16)
Bromacil	314-40-9	261.1		815(25)	>1M	0.39P	$2x10^{4}$E	B(44)/P?		OH

TABLE 2 (continued)

NAME	CAS	MW	VP(°C), torr	SOLUBILITY, PPM(°C)		log K_{ow}	WATER CHEM		AIR CHEM	
				Obs	Calc		k,hr^{-1}	Process	k,hr^{-1}	Process
Butadiene	25339-57-5	54.1	2500(20)	735(20)	$7x10^{-2}$ M	1.76	/ > 0.05 E	No chem/ V(37,43)	0.3	OH(16)/O_3
CDEC	95-06-7	223.8	$1.8x10^{-4}$ (25)	92			$7x10^{-4}$	H(23)	$6.8x10^{-2}$E	OH/O_3
Captan	133-06-02	300.6	$1x10^{-5}$(25)	< 0.5(25)	>1M	-0.05P	0.2	H(22)	0.2 E	OH/O_3
Carbaryl	63-25-2	201.2	0.005(26)	40(30)	$5x10^{-3}$ M	2.5	$4x10^{-3}$	P(39)/H (39)/V (37)	> $4.7x10^{-2}$ E	OH
Carbofuran	1563-66-2	221.3	$2x10^{-5}$(33)	700(25)	$5x10^{-3}$ M	2.55	$4x10^{-3}$ A	H(22)	0.02 E	OH
Chloroacetic acid	79-11-8	94.5	1(43)		>1M	-0.39P	$2x10^{-3}$ E	B(10)	$4.7x10^{-3}$ E	OH/R
Chloronitrobenzene		157.6	0.1	500	$8x10^{-3}$M	2.39	/ $5x10^{-3}$E	No chem/ V(37,C9)	< 0.03 E	P
ortho-	88-73-3									
meta-	121-73-3									
para-	100-00-5									
Chlorotoluene		126.6	2.7(20)	< 1000	$2x10^{-4}$ M	3.51	/ $1x10^{-2}$E	No chem/ V(37,C2)	$4.2x10^{-3}$E	OH
ortho-	95-49-8									
meta-	108-41-8									
para-	106-43-4									
Chloroxuron		290.7		3.7(20)			$1x10^{-4}$ E <$1x10^{-3}$E	B(44)/V (37)	2.1 x 10^{-2} E	OH
Creosote	8021-39-4	94-136		5000			$2x10^{-2}$ E	B(37,C10) /0	0.1 E	OH
Cumene	98-82-8	120.2	3.2(20)	50(20)	$1x10^{-4}$ M	3.75	/ <$2(x10)^{-2}$	No chem/ V(37,44,C9)	$2.8x10^{-2}$	OH (16)

TABLE 2 (continued)

NAME	CAS	MW	VP(°C), torr	SOLUBILITY, PPM(°C)		log K_{ow}	WATER CHEM		AIR CHEM	
				Obs	Calc^a		k,hr^{-1}	Process	k,hr^{-1}	Process
Cyanohydrins		85	15(81)				< 0.1 A	H(34)	1.0x10^{-3}E	OH
Cyclohexane	110-82-7	84.1	77(20)	55(20)	2x10^{-4} M	3.51	/ 3x10^{-2}	No chem/ V(37)	2.5x10^{-2}	OH(16)
Cyclopentadiene	542-92-7	66.1	300(RT)		0.05 M	1.84	/ 0.1	No chem/ V(37,C9)	0.3	OH/O_3
Diazinon	333-41-5	304.3	1.4x10^{-4} (20)	40		-	2x10^{-3}E	B(13)/H (12)/V (32)	3x10^{-3} E	OH/P
Diethyl maleate		172.1	.1(25)		0.2 M	1.4	2x10^{-2}E	B	0.2 E	OH/O_3
O,O-Diethyl-5-methyl phosphorodithioate		200.2						No data	1x10^{-3}E	OH
Dimethylamine		45.08	1300(20)	9000	>1M	-0.49	4x10^{-3}E	B(36)	0.2	OH(3)
Dimethyl disulfide		94.19	10(20)	1000	>1M	0.87	3x10^{-2}E	B/P/V	0.035	OH(3)
Dimethyl thiophosphoric acid		142.1					8x10^{-5}E	H	<6.5x10^{-4}E	OH/Rainout
DMTA, Dimethyldithiophosphoric acid		158.2					8x10^{-5}E	H	< 1x10^{-3}E	OH/Rainout
Dipropylamine		101.2	30(25)		0.1 M	1.67	4x10^{-3}E	B(37)	0.2 A	OH 3
Sym-N,N-Dipropylurea		144.2			0.1 M	1.64	2x10^{-3}E	B	0.2 E	OH

TABLE 2 (continued)

NAME	CAS	MW	VP(°C), torr	SOLUBILITY, PPM(°C)		log K_{ow}	WATER CHEM		AIR CHEM	
				Obs	Calc		k,hr^{-1}	Process	k,hr^{-1}	Process
Disulfoton		274	$1.8x10^{-4}$ (20)	25			$8x10^{-4}$E	B/H	0.05 E	OH
Diuron		233.1	$0.31x10^{-5}$ (50)	42(25)	0.2M	1.56P	$2x10^{-3}$ E	B(20,44) /H	< 0.2 E	OH
Ethanethiol	75-08-1	62.13	440(20)	15000	0.4M	1.20	0.04 E	B/V	0.1 A	OH (3)
Formic acid	64-18-6	46.0	35(20)		>1M	-.88	.04E	B(37)	0.025 A	OH (16)
Fumaronitrile	764-42-1	116.1	1(RT)		>1M	-0.89	$4x10^{-3}$ E	B/V	0.3 E	OH
Furfural	98-01-1	96.08	1(20)	83000	> 1. M	0.88	0.03 E	B(37)	0.3 A	OH(16)/O_3/
Hydroxyalachlor	Structure unknown									
Maleic acid	110-16-7	116.07			>1M	-0.58	$3x10^{-3}$E	B	0.01 E	OH
Maleonitrile	928-53-0	116.1	1(RT)		>1M	-0.89	$4x10^{-3}$ E	B (37)	0.3 E	OH
Methohyl	16752-77-5	162	$5x10^{-5}$ (25)	58000		/	$6x10^{-3}$E	B/H	0.05 E	OH
Methylparaoxon	950-35-6	247					0.02 A	B(25)	$6x10^{-4}$E	OH
Methylthioaceto-hydroxamate		105						B?	0.01 E	OH

TABLE 2 (continued)

NAME	CAS	MW	VP(°C), torr	SOLUBILITY, PPM(°C)		log K_{ow}	WATER CHEM		AIR CHEM	
				Obs	Calc		k,hr^{-1}	Process	k,hr^{-1}	Process
Naphthol	1321-67-1	144.16	1(94)	740	3x10^{-3}M	2.62	2x10^{-2}E	B(28,37)/ 0	0.1 A	OH$^{(16)}$
Pentachloroethane	76-01-7	202	1(RT)	100	1x10^{-4}M	3.64	/3x10^{-2}E	No chem/ V(37,C2)	1x10^{-4}	OH
Pentachloronitro- benzene	82-68-8	295	~10^{-5}(RT)	0.02	1x10^{-7}M	5.57 P	/ 0.01	No chem/ V(37)	< 0.01E	P?
Phenolformaldehyde-resin										
Phorate	298-02-2	260	8.4x10^{-4} (20)	50			8x10^{-4} E	B/H	0.1 A	OH
Phosphorodithioic acid,0,0-diethylesters		186					< 8x10^{-5}E	H	< 1x10^{-3} E	OH/R
Phosphorodithioic acid,S,S'-methylene 0,0,0',0' tetraethyl ester		353	1.5x10^{-8} (25)				8x10^{-4}E	B/H	< 1x10^{-3} E	OH
Phosphorothioic acid 0,0,0-triethyl ester	126-68-1	198					< 8x10^{-5}E	H	< 1x10^{-3} E	OH
Phosphorous acid, diethyl ester		138						No data	< 1x10^{-3}E	OH
Phosphorous sulfide		222.29					> 4x10^{-3}E	H		
Polyram		complex polymer					> 4x10^{-3}E	H (C5)		

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TABLE 2 (continued)

NAME	CAS	MW	VP(°C), torr	SOLUBILITY, PPM(°C)		log K_{ow}	WATER CHEM		AIR CHEM	
				Obs	Calc		k,hr^{-1}	Process	k,hr^{-1}	Process
Propenethiol		74			>1M	0.32	0.01E/ 0.03E	B/V(37, C2,C5)	0.1 A	(3) OH/O_3
Propionic acid	79-09-4	74					$3x10^{-2}$ E	B(15,37)	0.01 A	OH (16)
Propylamine	107-10-8	59.1	245(20)		>1M	0.43	$1x10^{-2}$ E	B (37)	0.10 A	OH (3)
							$2x10^{-3}$ E	B	0.01 E	OH (16)
N,N-di-n-Propylcanbamic acids (esters)		159 (methylester)								
n-Propylmercaptan		76.1	100(15)		0.07M	1.74	0.01	B/V	0.1 A	OH (3)
Sulfide,chloroethyl ethyl		124.5			0.1M	1.66P	0.03	H (4)	0.04 A	OH (16)
TEPP Tetraethylpyrophosphate	107-49-3	290	$1.5x10^{-4}$ (20)	misc			0.1	H (32)	< $1x10^{-3}$ E	OH
1,2,4,5-Tetrachlorobenzene	95-94-3	215	0.1(25)		$1x10^{-6}$	4.99	/ $9x10^{-3}$	No chem/ V(37,44, C9)	< $3x10^{-5}$ E	OH
Tetrachloroethane	25322-20-7	168	6(25)	2800	$3x10^{-3}$	2.66	/ 0.01	No chem/ V(37)	$7x10^{-4}$	OH
Tetrachloronitrobenzene	28804-67-3	260.5			$2x10^{-6}$	4.84P	/ $3x10^{-3}$	No chem/ V(37,C2, C9)	< 0.01E	P ?
Tetrachlorophenol	25167-83-3	232.0			$7x10^{-7}$	5.08P	$1x10^{-2}$A/ $3x10^{-3}$	O(6)/V	< $1.2x10^{-2}$ E	OH

TABLE 2 (concluded)

NAME	CAS	MW	VP(°C), torr	SOLUBILITY, PPM(°C)		log K_{ow}	WATER CHEM		AIR CHEM	
				Obs	Calc		k,hr^{-1}	Process	k,hr^{-1}	Process
2,3,4,6-Tetra-chlorophenol	58-90-2	232.0			$7x10^{-7}$	5.08	$3x10^{-3}$A		<$1.2x10^{-2}$E	OH
Trichloropropane	25735-29-9	147.5	2(20)	< 1000	$8x10^{-4}$	3.04	/ 0.02	No chem/ V(37,C2)	$1.6x10^{-3}$	OH
See 172 O,O,O-Triethylphosphorothioate										
Trimethyl dithiophospate	2953-29-9	172					$8x10^{-4}$E	B/H/C11)	< $1x10^{-4}$E	OH
See 222 O,O,S-Trimethyl phosphorodithioate										
O,O,O-Trimethyl phosphorothioate	152-18-1	156					< $8x10^{-5}$	H(22,C11)	<$1x10^{-4}$E	OH
Trioxazatri-cyclodecane	Need structure									
Vernolate	1929-77-7	203	$5.4x10^{-2}$ (24)	107			$2x10^{-3}$E	B(44)/V	0.01E	OH

COMMENTS

C1 In equilibrium with acid.

C2 Solubility estimated from approximate listings in reference 43: insol. = < 0.01 gl^{-1}; sl. sol. = < 0.1 gl^{-1}; sol. = 1 gl^{-1}, very sol. = > 10 gl^{-1}.

C3 Vapor pressure extrapolated from listed value in reference 43 by using approximation $\Delta p/\Delta T$ = 2fold/10°C.

C4 Hydrates instantaneously - water chemistry is for hydrate.

C5 Hydrolysis rate constant is for process which requires hydration and subsequent dissociation of the metal-organic complex.

C6 Rate for nicotinic acid.

C7 Ortho compound only.

C8 Rate for acetate.

C9 Vapor pressure extrapolated from listed value using estimation procedure in reference 37, p. D-155.

C10 Reactivity for cresols.

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Attachment 1

PHYSICAL CHEMICAL PROPERTIES OF HAZARDOUS WASTE CONSTITUENTS

by

G. W. Dawson
C. J. English
S. E. Petty

Project Officer

Jim Falco
Southeast Environmental Research Laboratory
Athens, Georgia

Prepared for

Environmental Protection Agency

March 5, 1980

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PHYSICAL CHEMICAL PROPERTIES OF HAZARDOUS WASTE CONSTITUENTS

INTRODUCTION

While the most accurate means of determining which wastes are hazardous involves direct hazard analysis of the intact waste, little such data currently exist. As a consequence, it has been determined that at least initially, determinations will be based on consideration of the known properties of individual constituents in the waste. Since much more data are available on these materials, this approach is far easier to implement at this time. Basic steps in the process include:

- Identification of waste stream components;
- Collection of pertinent data on those components; and
- Evaluation of the waste streams in light of the above data.

The following report documents the activities conducted pursuant to the second step--data collection. A brief narrative is provided to describe the methods employed for obtaining data, the format of the data, and the sources. Data on all compounds surveyed are appended.

DATA COLLECTION

In light of time constraints imposed on the subject work, data collection efforts were directed to a limited number of sources. The bulk of all data was taken from the Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained for the Environmental Protection Agency to assist in spill response work. For data segments and chemicals not presently included in that system, standard texts such as Sax(A-8) and the Merck Index(J-2) were employed. A complete listing of all sources is provided in the bibliography to the Appendix. Specific data are referenced on the individual data sheets.

Individual researchers were given lists of chemicals and standardized data sheets to indicate the collection process. Tables were made of missing data to facilitate secondary searches as time permitted. A sample of the standard data sheet employed for the study is provided in Figure 1. Notes on the type of data entered and the judgments employed are presented in the following.

FIGURE 1. Standard Data Collection Form

CHEMICAL NAME

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

SOLUBILITY

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

OCTANOL/WATER PARTITION COEFFICIENT

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

ODOR THREHOLD

TASTE THRESHOLD

DISCUSSION

Name: Each data sheet is identified by the common chemical name of the subject substance. This is typically the same name by which the compound /element is identified in the waste stream characterization documents. When the compound is the chemical name for a pesticide, the trade name is provided also.

Synonyms: Additional common trade and chemical names are given to the compound/element to assist in cross referencing. The listing is not exhaustive, but covers many of the synonyms employed in industry.

Molecular Weight: The molecular weight of each compound/element is provided.

Solubility: Solubility is given in mg/l or ppm for the temperature range 20-25°C. When quantitative data were not available and solubility was rated, the ratings were translated into quantitative values employing the following scale from Verschueren(A-11):

Practically insoluble	20 mg/l or less
Slightly insoluble	20 to 200 mg/l
Moderately soluble	200 to 1000 mg/l
Highly soluble	1000 - 10,000 mg/l
Extremely soluble	10,000 mg/l or more

If no rating were available, a value would be estimated based on known values for similar compounds. Whenever solubility was estimated, no reference was given and the entry was preceded by the symbol "→" indicating the value was deduced.

Density: Specific gravity is given for compounds in the temperature range 20 to 25°C unless otherwise noted.

Water Chemistry: A brief narrative statement is provided identifying the compound's interaction with water including propensity to ionize or hydrolyze.

Soil Attenuation: Data are given with respect to the interaction of solutions of the compound and soil. Entries include both a narrative description and quantitative data when possible. The latter are largely specific values for Kd and Koc as reported in the literature. tKd refers to the ratio of the materials concentration in the solid phase and that in the solution phase at equilibrium i.e., $\frac{\text{(material sorbed on soild particles)}}{\text{(material in solution)}}$. The Koc is the same measure adjusted to the organic content of the soil i.e., $\frac{\text{(material sorbed on the organic matter in soil)}}{\text{material in solution}}$.

Volatility: Vapor pressure in psia, mm Hg or torr is given for the temperature range 20-25°C unless otherwise specified.

Vapor Density: Vapor density is given as the ratio of the compound's vapor weight to an equivalent amount of air under the same conditions.

Evaporation Rate: Data are given on the rate of disappearance of the compound through evaporation. This may be presented as a loss rate for a pool of pure material (cm/sec), as a relative rate comparing to a standard material (factor times the rate of ethyl ether), or as a volatilization half-life (unit time^{-1}). In the third case, the data refers to loss from an aqueous solution and assumes a first order rate of loss:

$$C = Coe^{-at}$$

Environmental Persistence: Narrative and quantitative data are given with respect to observed or predicted persistency of the compound in the environment. Data may refer to hydrolysis, chemical, photochemical, or biochemical degradation mechanisms. When possible observations are translated into environmental half-lives assuming first order decay rates. When biochemical half-lives were derived from BOD_5 data in this manner, an attempt was made to use results of tests with river water seed. Much of the quantitative data in this section came from work performed at Stanford Research Institute (Reference G-13) where structural considerations were reviewed to predict breakdown mechanisms and rates.

Octanol/Water Partition Coefficient: Values are given for Kow or the log of Kow where Kow is defined as the ratio of the chemicals concentration in octanol to that in water when an aqueous solution is intimately mixed with octanol and allowed to separate. This value is reflective of bioaccumulation potential. Much of the data were obtained from a compendium of partition values developed and maintained by Dr. Corlan Hansch at Pomona College, Pomona, CA(G-14).

Bioaccumulation Potential: Emperical data are given for the concentration factor by which the concentration of the compound is multiplied in living organisms above that of its surrounding environment. This is most simply defined as the ratio of the concentration of the compound in the organism to its concentration in water the organism is exposed to. Some values identified as BCF (Biological Concentration Factor) are derived through an algorythmn operating on data for octanol/water partition coefficients, Koc or other physical-chemical data.

Inhalation: Limited amount of data are given on the TLV (Threshold Limit Value) and the LC50 (Median Lethal Concentration) for the compound. The first is the concentration in air deemed acceptable for work room exposures over an eight hour work day. The latter refers to the concentration in air required to kill half of the exposed population over a specified exposure period. Each is a relative measure of toxic vapor hazard.

RAT LD50: The oral LD50 (Median Lethal Dose) for rats is given in mg compound per kg of rats body weight unless otherwise specified. This is a relative measure of oral toxic hazard and refers to the body burden required to kill one half an exposed population over a 24 hour feeding period. Lacking this, data are given for alternative test species or alternate routes of exposure such as intravenous or interperitoneal. A second entry is provided for designated priority pollutants. The human health criteria level is given as the MAC and defines the maximum allowable concentrations for these compounds in water. For carcinogens, the MAC level was selected as the level associated with an increase of one case of cancer in 100,000 or the 10^5 risk level.

Odor Threhold: Data are given for the concentration of the compound at which its odor becomes detectable.

Taste Threhold: Data are given for the concentration of the compound at which its taste in water becomes detectable.

Discussion: This segment was included to allow for the inclusion of some interpretive inputs. In general, the latter were restricted to three relative hazard indices: DWHI (Drinking Water Hazard Index), VHI (Vapor Hazard Index), and CWHI (Chronic Water Hazard Index). The first index is a measure of relative acute hazard. Ostensibly it is the ratio of solubility and the lethal concentration for water consumed in a 24 hour period. This is defined as

$$\text{DWHI} = \frac{\text{Solubility}}{\text{Lethal Concentration}}$$

The lethal concentration is estimated assuming a 70 kg man consuming 2 liters of water a day and is defined as the concentration at which a body burden equivalent to that received with an LD50 is attained. Hence:

$$\text{Lethal Concentration} = \frac{\text{LD50} \times 70}{2}$$

It follows that:

$$\text{DWHI} = \frac{\text{sol (mg/l)}}{35 \times \text{LD50 (mg/kg)}}$$

Should this index be greater than one, the compound is soluble enough to reach lethal levels in water. The higher the index, the greater the probability of that occurring.

The CWHI was devised to provide insight into potential chronic exposure problems. The DWHI looks only at an acute exposure and does not account for prolonged contact or accumulation potential. Hence, it greatly underestimates the risk posed by a material such as dioxin which is highly insoluble and most damaging with chronic as opposed to acute exposure. The CWHI is defined as

$$\text{CWHI} = \frac{\text{Solubility (mg/l)}}{\text{MAC (mg/l)}}$$

where MAC is the human health criteria level set for priority pollutants. As such, the CWHI has been calculated only for the priority pollutants. A value greater than one once again reflects the potential for a compound to be mobil enough to present a chronic toxic hazard. The greater the index, the greater that potential.

The VHI is a measure of potential inhalation hazards associated with volatile materials. It is derived as the ratio between essential vapor concentrations 500 yards downwind from a pool of the chemical and the TLV or LC50 concentration for that compound. The estimated vapor concentrations is assumed to be:

$$\text{VC} = \frac{(\text{vapor pressure})}{760}\ (0.2)$$

where the 0.2 accounts for dispersion losses in relatively stable air. The index itself is then defined as:

$$\text{VMI} = \frac{\text{VC}}{\text{TLV}} \text{ or } \frac{\text{VC}}{\text{LC50}}$$

depending on the vapor toxicity data available. When the TLV is employed, a VHI $\geq$ 10 to 100 is necessary to indicate a highly probable threat since the TLV value contains safety factors. When the LC50 value is employed, a VHI $\geq$ 1 to 10 indicates high potential for vapor hazards. Once again, higher index values are associated with higher potential health problems.

Individual data sheets on all compounds/elements reviewed and a complete set of references are appended.

FURTHER USE OF HAZARD INDICES

While the hazard indices developed for use in this work must be employed cautiously, they do provide some measure of relative hazard which can help focus attention on the areas of greatest concern. With respect to hazardous waste management, the most important mode of exposure will be chronic exposure in water. Unfortunately, the chronic hazard index provided on the data sheets, the CWHI, could only be calculated for priority pollutants. To broaden the coverage of the chemicals evaluated, a more widely applicable chronic index was devised: the WHI.

The acute index, DWHI, suffers from its inability to account for prolonged exposure. As such, it underestimates the hazard posed by accumulative materials since exposure to these at much lower levels will eventually lead to body burdens associated with lethality. The lower concentrations at which this may occur can be calculated if the bioconcentration factor for the compound is known (BCF). For instance, exposure to a material with BCF=10 over a 24 hour period will yield the same body burden as chronic exposure (essentially in perpetuity) to one tenth the concentration. Recognizing this, the lethal concentration for materials with chronic exposure is the acute lethal concentration divided by BCF, or:

$$\text{Lethal concentration} = \frac{\text{LD50} \times 70}{2 \times \text{BCF}}$$

Hence,

$$\text{WHI} = \frac{\text{Solubility} \times \text{BCF}}{30\ \text{LD50}} \quad \text{or}$$

$$\text{WHI} = \text{DWHI} \times \text{BCF}.$$

Once again, an index greater than one indicates the potential for chronic health problems from contaminated water. The higher the index, the greater the opportunity for the hazard to be experienced.

In all cases, the absolute value of these indices is not of importance. The relative value is of major concern. Values for all of the compounds reviewed are presented in Table 1.

TABLE 1. Summary of Indices Calculated for Compounds Reviewed

ID Number	Name	DWHI	VMI	CWHI	WHI
1.	Acetaldehyde	1.5	973 (TLV)		1.5
4.	Acetonitrile	0.752	487 (TLV)		0.752
5.	Acetophenone	0.175	289 (TLV)		0.175
7.	Acetyl Chloride	0.866	316 (TLV)		0.866
9.	Acrolein	248	6.63×10^{5} (TLV)	6.2×10^{7}	1.5×10^{5}
10.	Acrylamide	410	18.4 (TLV)		410
11.	Acrylic Acid	8.40	619 (TLV)		
12.	Acrylonitrile	22.6	1050 (TLV)	8.8×10^{8}	2.4×10^{3} C
13.	Alachlor	.0038			.32
14.	Aldrin	1.43×10^{-5}	2.92×10^{-2}	5.4×10^{5}	0.64 C
15.	Ammonia				
16.	Ammonium Acetate	292			2.92
18.	Ammonium Cyanide			5×10^{3}	
19.	Ammonium Methacrylate				
20.	Ammonium Sulfate	6.72			6.72
21.	Antimony Pentachloride	255	632 (TLV)		4.1×10^{6}
22.	Antimony Trichloride	255	316 (TLV)	4.1×10^{8} C	4.1×10^{6}
23.	Aniline	1.33	42.1 (TLV)		5.3
24.	Arsenic	9.52		2.5×10^{8} C	2.6×10^{5}
25.	Atrazine	3.06×10^{-4}			3.06×10^{-4}
26.	Benzo(a)anthracene				
28.	Benzene	9.18	790 (TLV)	1.2×10^{5} C	180
29.	2-Chloro-4-Nitro Benzoic Acid	2.1×10^{-5}			5.1×10^{-1}
30.	4-Chloro-3-Nitro Benzoic Acid	3.0×10^{-5}			7.2×10^{-1}
31.	p.-Chloro Sodium Salt of Benzoic Acid	4			4
32.	Benzofluoranthene				
34.	Benzo(a)pyrene				
35.	Benzotrichloride		1.05		
36.	Benzyl Chloride		263 (TLV)		
37.	Bicycloheptadiene				
38.	Bromacil	4.48×10^{-3}			4.48×10^{-3}
39.	1, 3-Butadiene		484 (TLV)		
41.	Cadmium	3.97×10^{-3}		2×10^{3}	3.97
42.	Captan	1.59×10^{-3}			1.59×10^{-3}
43.	Carbaryl	5.29×10^{-1}	4.2×10^{-2} (TLV)		5.29×10^{-1}
44.	Carbofuran	2.5			2.5
45.	Carbon Tetrachloride	5.71×10^{-3}	3.07 (TLV)	3×10^{5} C	0.11
46.	Chloral	6.21			48
47.	Chloroacetaldehyde	497	1.32×10^{4}		
48.	Chloroacetic Acid	37.6			37.9
49.	Chloroaniline meta	0.325	395 (TLV)		4.24
	para	0.680	65.8 (TLV)		8.9
50.	Chlorobenzene	4.78×10^{-3}	35.1 (TLV)	2.4×10^{4}	.22
53.	Chlordane	5.14×10^{-4}	6.31×10^{-3}	9.5 C	5.5
54.	Chlordene				
55.	Chloro Alkyl Ether BCEE	3.89	12.4 (TLV)	2.4×10^{10} C	3.89
56.	Chloroform	0.125	1680 (TLV)	3.9×10^{6} C	7.5
57.	Chloronitrobenzene	5.71×10^{-3}	1750 (TLV)		.171
40.	CDEC	3.09×10^{-3}			3.09×10^{-3}
59.	2-Chlorophenol	1.22		1.4×10^{7}	24
60.	3-Chlorophenol	1.3			39
61.	4-Chlorophenol	1.16	657 (TLV)	9×10^{5}	32
62.	Chlorotoluene	2.32×10^{-5}	14.2 (TLV)		2×10^{-3}
63.	Chloroxuron	2.86×10^{-5}			1.8×10^{-3}
64.	Creosote				

TABLE 1. (Continued)

ID Number	Name	DWHI	YMI	CWHI	WHI
65.	Chromium	1.59×10^{-5}		2.5×10^{6}	1.6×10^{-2} C
66.	Cumene	4.91×10^{-4}	24.2 (TLV)		7×10^{-2}
67.	Acetone Cyanohydrin	215	342 (TLV)		2.5
68.	Cyclohexane	4.31×10^{-5}	70 (TLV)		4.2×10^{-3}
69.	Cyclopentadiene		7.01 (TLV)		
70.	Diazinon	1.14×10^{-2}	0.368 (TLV)		.38
71.	o-Dichlorobenzene	7.03×10^{-3}	0.7	5.4×10^{2}	.65
72.	p-Dichlorobenzene	4.51×10^{-3}	2.1 (TLV)		.97
73.	1,2 Dichloroethane	0.323	72 (TLV)	1.2×10^{6} C	2.8
74.	2,4 Dichlorophenol	0.306		9.2×10^{6}	20
75.	2,6 Dichlorophenol	0.337		9.3×10^{1}	17
76.	2,4-D	4.72×10^{-2}	3.15×10^{-2} (TLV)		4.72×10^{-2}
77.	Dichloropropane	4×10^{-2}	175 (TLV)	1.3×10^{4}	.8
78.	2,3 Dichloropropane	9×10^{-2}			9×10^{-3}
79.	Dicyclopentadiene	9.2×10^{3}	26.3 (TLV)		.62
80.	Dieldrin	1.43×10^{-4}	2.25	4.2×10^{9} C	.84
81.	Diethyl Maleate	.893			6.8
82.	Diethyl, Methyl Phosphorodithionate	.0266			.0266
83.	Dimethyl Amine	5.29	3.4×10^{4} (TLV)		5.29
84.	Dimethyl Disulfide				
85.	Dimethyl Phosphorothioic Acid				
86.	Dimethyl Dithiophosphoric Acid				
88.	Sym Dimethylurea	2.08			2.08
89.	Dinitrobenzene	1.06	175 (TLV)		10
89.	o-Dinitrobenzene	2.22	175 (TLV)		22
90.	Dipropylamine	7.14	1.58×10^{4} (TLV)		76
91.	Dipropyl urea				
92.	Disulfoton	.09			.09
93.	Diuron	3.53×10^{-4}			3.53×10^{-4}
94.	Epichlorohydrin	10.5	67 (TLV)		10.5
95.	Ethyl Mercaptan		37.9		
99.	Ethyl Acrylate	.42	308		1.95
100.	Ethyl Chloride		2.66		
101.	Ethylene Diamine	24.6	3.05 (TLV)		113
103.	Ethylene Thiourea	.286			.286
104.	Ferbam	2×10^{-4}	0.032		1.1×10^{-3}
105.	Formaldehyde	3.6	184 (TLV)		3.6
106.	Formic Acid	.71	1690 (TLV)		.71
107.	Fumaronitrile				
108.	Furan		19,900 (TLV)		
109.	Furfural	4.74	52.6 (TLV)		4.74
112.	Heptachlor	1.23×10^{-5}	.19	2.4×10^{5} C	.21
113.	Hexachlorobenzene	2×10^{-5}	3.58×10^{-2} (TLV)	2.3×10^{4}	.16
114.	Hexachlorobutadiene	3.2×10^{-3}	39.4 (TLV)	6.5 C	1.3
115.	Hexachlorocyclopentadiene	5.7×10^{-4}	2100 (TLV)	2.7×10^{4}	.11
118.	Hexachloroethane	2.9×10^{-2}	263 (TLV)	8.5×10^{3} C	.18
119.	Hexachlorophene	1.9×10^{-6}			3.1×10^{-2}
121.	Hydrofluoric Acid	21.8			21.8
122.	Hydrogen Cyanide	52.5	1.44×10^{4} (TLV)	2×10^{7}	52.5
123.	Hydroquinone	39.7	59.8 (TLV)		39.7
127.	Lead	3.3×10^{-7}		2	9.4×10^{-5}
129.	Malathion	3×10^{-3}	8.42×10^{-4}		3×10^{-3}
131.	Maleic Acid	.17			.17
132.	Maleic Anhydride	5.48	1000 (TLV)		5.48
133.	Maleonitrile	468			468

TABLE 1. (Continued)

ID Number	Name	DWHI	VMI	CWHI	WHI
134.	Maneb	4.23×10^{-4}			4.23×10^{-4}
135.	Methacrylonitrile	4.08	10,500		109
136.	Methanol	4.93	132 (TLV)		4.93
137.	Methomyl	16.8			706
138.	Methyl Chloride		2000	2×10^5	
139.	Methylene Chloride	.22	184	10^7	.22
140.	Methyl Methacrylate	1.5×10^{-4}	105 (TLV)		1.5×10^{-4}
141.	Methyl Paraoxon	.23			1.51
142.	Methyl Parathion	.079	2.6×10^{-5}		7.
143.	α Methylstyrene	5.8×10^{-6}	6.05		4.8
145.	Mononitrobenzene	.072	3.9	6.3×10^4	.94
146.	Nabam	1.45			17.8
147.	α Naphthol	3.2×10^{-3}			1.3
148.	Naphthoquinone	.015			.18
149.	Nicotinonitrile				
150.	Nitrodipropyl Amine				
151.	Nitrofuran				
153.	Nitrophenol m,o,p	.41,.14,.62			4.5,1.5,6.8
154.	Diethylnitrosamine	0.2		$>1.5 \times 10^5$ C	0.2
156.	Nitrotoluene m,o,p	.013,.021,.006	13.15,5.26,5.26(TLV)		.34,.55,.16
159.	Paradehyde	2.08			2.08
160.	Parathion	.19	.719		9.5
161.	Pentachlorobenzene	1×10^{-4}		2.7×10^5	.5
163.	Pentachloroethane	8.16×10^{-3}	.31(LC50)263(TLV)		8.16×10^{-3}
164.	Pentachlorophenol	.002	0.579 (TLV)	100	1.5
166.	Pentadiene				
167.	Phenol	3.612	18.4 (TLV)	2×10^4	26.4
169.	Phorate	.893			5.7
170.	0,0 Diethyl Phophorodithioate				
171.	Phosphorolithioic Acid, Methylene tetraethyl Ester				
172.	0,0,0 Triethyl phosphorothioate				
175.	Phosphorous Sulphide	7.3×10^{-5}	31.6 (TLV)		7.3×10^{-5}
176.	Phthalic Anhydride	.221	2.63×10^{-2} (TLV)		.221
180.	Polyram	2.86×10^{-6}			
182.	Propionic Acid	6.66	253 (TLV)		6.66
183.	Propylamine	50.1	2.5×10^4 (TLV)		50.1
185.	Propyl Mercaptan	1.6×10^{-4}	7.2		8.9×10^{-4}
186.	Pyridine	18.1	1050 (TLV)		18.1
189.	Sodium Fluoride	17.6	2.5 (TLV)		17.6
192.	Succinonitrile	286			286
194.	Chloroethyl ethyl sulfide	1.13			7.8
196.	2,4,5-T	.026	.316		.65
198.	TCDD	3.6×10^{-4}		4×10^5 C	2
200.	TEPP	2381			2381
201.	1,2,4,5 Tetrachlorobenzene	1.1×10^{-4}		3.5×10^2	.51
202.	Tetrachloroethane	.4	253 (TLV)	2.5×10^5 C	3.2
204.	Tetrachloronitrobenzene	1.1×10^{-3}			.51
206.	2,3,46 Tetrachlorophenol	.204		3.8×10^3	45.3
207.	Tetrahydrofuran	57.1	231 (TLV)		57.1
208.	Toluene	.002	37.4 (TLV)	38	.04
209.	Toxaphene	.001	.001	6.4×10^5 C	15
210.	Trichlorobenzene	.001	5.26 (TLV)	2.3×10^3	.5
212.	1,1,1 Trichloroethane	2.64×10^{-3}	75.1 (TLV)	2.8×10^2	5.5×10^{-2}
213.	1,1,2 Trichloroethane	6×10^{-2}	500 (TLV)	7.4×10^4 C	1.2

TABLE 1. (Continued)

ID Number	Name	DWHI	VMI	CWHI	WHI
215.	2,4,5 Trichlorophenol	.07		2×10^5	9.7
216.	2,4,6 Trichlorophenol	.028			3.4
217.	1,2,3 Trichloropropane	.009	10.5 (TLV)		.009
221.	Trifluralin	1.66×10^{-6}			7.6×10^{-3}
222.	D,0,S-Trimethyl Phosphorodithioate				
223.	Trimethyl Phosphate	.017			.017
225.	0,0,0 Trimethyl Phosphorothioate				
226.	1,3,5 Trinitrobenzene	.02			.15
228.	Vernolate	.001			.001
229.	m-Xylene	.001			.09
230.	p.-Xylene	.001			.07
231.	Zineb	5.5×10^{-5}			6.7×10^{-4}
232.	0-Xylene	.001	13.2 (TLV)		.05
233.	Isobutanol	1.1	26.3 (TLV)		1.1
234.	Butyl Alcohol	0.955	1.45 (TLV)		0.955
235.	Cacodylic Acid	27.2			7.3×10^5
236.	Carbon Disulfide	.029	34.2 (TLV)		.47
237.	2 Chloropropane	2.86×10^{-4}	2750 (TLV)		2.86×10^{-4}
238.	Cresol	0.656	26.3 (TLV)		10.2
239.	Cyanogen Chloride	1.83	2050 (LC50)		
240.	Cyclohexanone	.198	12.6 (TLV)		.198
241.	1,3 Dichloropropene	.25	5200 (TLV)	4.3×10^6	.25
242.	Diethylene Glycol	.183	4.5×10^{-3} (TLV)		.183
243.	Diethylene Glycol Monobutyl Ether	.436			.436
244.	Ethylene Glycol Monoethyl Ether	19.3	20.1		19.3
245.	Ethylene Glycol Monobutyl Ether	1.14	3.26 (TLV)		1.14
246.	Ethyl Ether	.06	291 (TLV)		.06
247.	Methyl Ethyl Ketone	.72	132 (TLV)		.72
248.	Methyl Isobutyl Ketone	.261	42.1 (TLV)		.261
249.	Trichlorotrifluoroethane		105 (TLV)		
250.	Triethylene Glycol	1.3			1.3

COMPLETED DATA SHEETS FOR
HAZARDOUS WASTE CONSTITUENTS

(Compounds ordered as found in Table 1.)

CHEMICAL NAME

Acetaldehyde

SYNONYM/OTHER NAMES

Ethanol, Aldehyde, Acetic-Aldehyde, Ethylaldehyde

MOLECULAR WEIGHT

44.05

SOLUBILITY

10,000 ppm @ 25°C (2)

DENSITY

.783 @ 25°C (Sp. Gr.) (2)

WATER CHEMISTRY

Will be dissolved in water. Moderate weather will volatilize some of the compound and may prevent much of it from reaching the water and dissolving.(2)

SOIL ATTENUATION

Sorption will be better on soils with higher organics content (peat) and clays with greater surface area (montmorillonite).(2)

VOLATILITY

740 mm Hg @ 20°C (2)

VAPOR DENSITY

1.52 (2)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

93% theoretical (lb/lb) BOD_5 with activated sludge seed. BOD data indicate fairly rapid acclimation of biota and subsequent degradation. High doses, however, can stifle oxygen utilization and cause persistence. Chemically degrades to acetic acid after exposure to air. Acetic acid is easily degraded.(2)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

No body storage, since material is rapidly oxidized, metabolized, and excreted.(2)

INHALATION

TLV = 200 ppm (S-12)

RAT LD_{50}

1900 mg/Kg

ODOR THRESHOLD

2.3 ppm

TASTE THRESHOLD

DISCUSSION

DWHI = 1.50

VHI = 973 (TLV)

CHEMICAL NAME

Acetonitrile

SYNONYM/OTHER NAMES

Methylcyanide, Cyanomethane, Ethanenitrille

MOLECULAR WEIGHT

41.05 (E-2)

SOLUBILITY

Miscible (1)

DENSITY

48.8 lb/ft^3 @ 20°C (1)

WATER CHEMISTRY

Does not dissociate appreciably. Does react with water to produce flammable and toxic vapors.(J-1)

SOIL ATTENUATION

Basic soils may provide release of cyanide. High organic or high surface area clays will have best capacity.(2)

VOLATILITY

1.3 psia @ 20°C (3) 74 torr (G-13)

VAPOR DENSITY

10^{-2} lb/ft^3 @ 20°C (3)

EVAPORATION RATE Volatilization Const. 7 X 10^{-3} hr.$^{-1}$ (G-13)

Very low as it is highly soluble (3)

ENVIRONMENTAL PERSISTENCE

Overall degradation rate = 2.3 X 10^{-2} hr^{-1} (G-13). 0% theoretical BOD, 5 days, quiescent; 70% theoretical, 28 days activated sludge. Slowly degrades to CN, which is persistent. (2)

OCTANOL/WATER PARTITION COEFFICIENT Kow = $10^{-.34}$ (G-14)

BIOACCUMULATION POTENTIAL

INHALATION

TLV = 40 ppm

RAT LD$_{50}$

3800 mg/Kg (2[ADC])

ODOR THRESHOLD

40 ppm (2[C-11])

TASTE THRESHOLD

DISCUSSION

DWHI = 0.752
VHI = 487 (TLV)

CHEMICAL NAME

Acetophenone

SYNONYM/OTHER NAMES

Hypnone, Phenylmethylacetone, Acetylbenzene

MOLECULAR WEIGHT

120.1 (E-1)

SOLUBILITY

0.55 lb/100 lb H_2O @ 20°C (3)

DENSITY

62.6 lb/ft^3 @ 20°C (3)

WATER CHEMISTRY

No reaction with water (3)

SOIL ATTENUATION

Adsorption capacity proportional to organic content of soils and surface area of clays. (2)

VOLATILITY

1mm @ 15°C (512)
2.4 mm Hg @ 50°C (3)

VAPOR DENSITY

5.3 g/l (3)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Overall degradation constant = 2.7×10^{-3} hr^{-1} (G-13). Should degrade slowly. Sinks to bottom of water course. Freezing point = 20°C, may exist as solid on bottom. (3)

OCTANOL/WATER PARTITION COEFFICIENT - log Kow = 1.59 (G-13)

BIOACCUMULATION POTENTIAL

None noted (2)

INHALATION

TLV = 1 ppm (512)

RAT LD_{50}

900 mg/Kg Oral (2[R-119])

ODOR THRESHOLD

3.00 ppm (E-1)

TASTE THRESHOLD

DISCUSSION

DWHI - 0.175

VHI = 289 (TLV)

CHEMICAL NAME

Acetyl Chloride

SYNONYM/OTHER NAMES

Ethanoyl Chloride

MOLECULAR WEIGHT

78.50 (E-2)

SOLUBILITY

Decomposed by H_2O (1)

DENSITY

1.105 gm/cm^3 @ 20°C (3)

WATER CHEMISTRY

Reacts violently with water to produce acetic acid and HCl.(1)

SOIL ATTENUATION

Neutralized by alkaline soils. Likely to be decomposed by soil moisture.(2)

VOLATILITY

135 mm Hg @ 7.5°C (2)

VAPOR DENSITY

2.70 g/l @ 38°C (3)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Same as for acetic acid and HCl.(1) Hydrolysis rate const. = 200 hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

Not applicable as it reacts completely with water.

BIOACCUMULATION POTENTIAL

Same as for acetic acid and HCl (1)

INHALATION

RAT LD_{50}

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 0.866 (for acetic acid)
VHI = 316 (TLV for acetic acid)

CHEMICAL NAME

2-Propenal (Acrolein)

SYNONYM/OTHER NAMES

Aqualin, Magnacide, Acrylaldehyde, Allylaldehyde

MOLECULAR WEIGHT

56.1 (M-10)

SOLUBILITY

25% @ 68°F (M-11)
40% @ 25°C (2) 400,000 ppm (G-10)

DENSITY

0.841 20/4 (M-10)

WATER CHEMISTRY

Primary degradation reaction: reversible hydrolysis to B-hydroxypropeonaldehyde -- less volatile.(1)

SOIL ATTENUATION

Kd ~0.2 (M-8) Soil adsorption directly proportional to organic content and clay surface area.(2)

VOLATILITY

v.p. 210 mm Hg @ 20°C (M-10)

VAPOR DENSITY

1.94 (M-22)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Remains in water for 2-3 days depending on water temperature.(M-10) BOD, 33% theoretical, 10 days (quiescent).(C-10) BOD, 30% theoretical, 5 days (acclimated seed).(E-76) Degradation and evaporation - major pathways for loss - smaller amounts lost through adsorption and uptake in aquatic organisms and sediments.(M-21)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

340-600x for bluefills; half-life in fish tissue >7 days.(1)

INHALATION

0.10 mg/m^3 (2)

RAT LD$_{50}$

MAC = 6.5 μg/l (307)

46 mg/Kg (M-10)

ODOR THRESHOLD

1.0 (Q-18) .21 ppm (2)

TASTE THRESHOLD

DISCUSSION

DWHI = 248

VHI = 6.63 X 10^5 (TLV)

CWHI = 6.2 X 10^7

CHEMICAL NAME

Acrylamide

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

71.08

SOLUBILITY

215.5 g/100 ml @ 30°C (S-10)

DENSITY

1.22 g/cm^3 (S-7)

WATER CHEMISTRY

Very soluble in H_2O (S-10)

SOIL ATTENUATION

VOLATILITY

.007 mm Hg @ 25°C, 2 mm Hg @ 87°C (S-10)

VAPOR DENSITY

2.45 (S-7)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Acrylamide is very water soluble and biodegradable. Given COD as 1,300,000 ppm: 1) BOD_5 with river microorganisms acclimated to acrylamide is 75% COD; 2) BOD_5 with river microorganisms acclimated to acrylonitrile is 17% COD; and 3) BOD_5 with unacclimated sewage seed is 13% of COD. Rapid biological breakdown. Bacterial degradation rate 0.03 hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

Should be very low (S-10) Kow = $10^{-.99}$ (G-13)

BIOACCUMULATION POTENTIAL

Acrylamide does not bioconcentrate (S-10)

INHALATION

TLV = 0.10 ppm (S12)

RAT LD_{50}

150-180 mg/Kg (S-11)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 410
VHI = 18.4 (TLV)

CHEMICAL NAME

Acrylic Acid

SYNONYM/OTHER NAMES

Propenoic Acid, Vinyl Formic Acid, Acroleic Acid

MOLECULAR WEIGHT

72.1 (E-1)

SOLUBILITY

Miscible (3)

DENSITY

65.1 lb/ft^3 @ 20°C (3)

WATER CHEMISTRY

Highly soluble, undergoes acid dissociation.(2)

SOIL ATTENUATION

Basic soils will neutralize. Acrylate radical may or may not be held due to precipitation by soil salts. Organic soils and high surface area clays may hold some of the acrylate. (2)

VOLATILITY

0.080 psia @ 20°C (3) 4 mm Hg (G-13)

VAPOR DENSITY

0.0010 lb/ft^3 @ 20°C (3)

EVAPORATION RATE

Very low as it is highly soluble (3)

ENVIRONMENTAL PERSISTENCE

Subject to photochemical attack at the unsaturated bond. 35% of theoretical BOD in 10 days, 81% of theoretical BOD in 22 days, acclimated seed. Will polymerize in presence of oxygen.(1)

OCTANOL/WATER PARTITION COEFFICIENT

Miscible in ethanol (J-21) Kow = $10^{.13}$(G-13)

BIOACCUMULATION POTENTIAL

None noted (2)

INHALATION

TLV = 1.7 ppm (S12)

RAT LD_{50}

340 mg/Kg (2[R-19])

ODOR THRESHOLD

9.4 ppm (E-1)

TASTE THRESHOLD

DISCUSSION

DWHI = 8.40

VHI = 619 (TLV)

CHEMICAL NAME

Acrylonitrile

SYNONYM/OTHER NAMES

Propene Nitrile, Vinyl-Cyanide, Cyano-Ethylene, Fumigram, Ventox

MOLECULAR WEIGHT

53.0 (E-1)

SOLUBILITY .

7.35 gm/100 gm H_2O @20°C (1)

DENSITY

0.8060 gm/cm^3 @ 20°C (1)

WATER CHEMISTRY

No reaction with water (3)

SOIL ATTENUATION

Degree of adsorption on natural soils should be proportional to organic content and surface area of clays. Cyanide formed will not be exchanged as an anion.(2)

VOLATILITY

80 mm Hg @ 20°C (J-4)

VAPOR DENSITY

0.015 lb/ft^3 @ 20°C (3)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

25% of theoretical in 10 days using sewage seed in quiescent state. 67% of theoretical in 10 days using river water with sewage seed. Undergoes photodegradation to saturated derivatives. Short lived in aqueous environment. 10 ppm degraded by day 6.(J-27)

OCTANOL/WATER PARTITION COEFFICIENT

Log = 0.14 (S-9) Log Kow = -0.92 (G-14)

BIOACCUMULATION POTENTIAL

EPA estimated the weighted average bioconcentration factor for acrylonitrile to be 110 for the edible portions of fish and shellfish consumed by Americans. Bioconcentration factor = 48 in fish,(59) and 110 for edible flesh.(J-28)

INHALATION

TLV = 20 ppm (S12)

RAT LD$_{50}$ MAC = .084 μg/l (307)

93 mg/Kg (2[APD])

ODOR THRESHOLD

2.14 ppm (E-1)

TASTE THRESHOLD

DISCUSSION

DWHI = 22.6 CWHI = 8.8 X 10^8

VHI = 1050 (TLV)

CHEMICAL NAME

2-Chloro-2',6'-Diethyl-N-(Methoxymethyl)Acetanilide (Alachlor)

SYNONYM/OTHER NAMES

CP 50144, Lasso

MOLECULAR WEIGHT

270 (4)

SOLUBILITY

242 ppm @ 25°C (M-10)

DENSITY

1.133 @ 25/15.6°C (M-10)

WATER CHEMISTRY

SOIL ATTENUATION

Kd ~50 (M-8) Adsorbed by soil colloids.(M-10) Koc = 190 (G-7)

VOLATILITY

v.p. 2.2×10^{-5} mm Hg @ 25°C (M-10)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Water persistence dependent on aerobic/anaerobic nature -- half-life, 4 days in anaerobic stream with sediments. Very stable in hard water lake. Bioconcentration at steady state -- bluegill. Edible, 50-100x, inedible, 500-700x.(Monsanto Conv.) Predominant transport mode -- likely to move in appreciable proportion with both sediment and water.(M-7) Microbial breakdown ~90%, chemical breakdown ~10%. Loss from photodecomposition/volatilization is low. Average persistence is 6-10 weeks. Reduced in sandy soils, low in organic matter.(M-10) Overall degradation rate const. = 0.17 day^{-1}

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 830 (G-7)

BIOACCUMULATION POTENTIAL

Factor is 0 (M-9)

INHALATION

RAT LD_{50}

9300 mg/Kg (Lasso 15G)
1800 mg/Kg (Lasso EC) (M-10)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 0.00074 (Lasso 156)
0.0038 (Lasso ES)
VHI = N/A

CHEMICAL NAME

1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-Hexahydro-1,4 Endo-8-Exo-Dimethanonapthalene (Aldrin)

SYNONYMN/OTHER NAMES

Aldrin; Trade Names: Aldrec, Algran, Octalene, Soilgrin

MOLECULAR WEIGHT

365 (M-4)

SOLUBILITY

0.025 mg/l M-4)

DENSITY

1.650 (2)

WATER CHEMISTRY

SOIL ATTENUATION

Kd - 7 X 10^4 (M-8) Nature of clay minerals does not affect adsportion. Soil sorption depends on mechanical composition and organic content. Heat speeds degradation (12). Koc - 253 (G-2), 410 (G-7).

VOLATILITY

v.p. 2.31 X 10^{-5} mm Hg @ 20°C; (M-4)
6 X 10^6 mm Hg @ 25°C (3)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Aldrin is photoconverted by ultraviolet light to dieldrin and aldril isomers which may be more toxic to fish. (1) Will enter water as wettable powder or with emulsifier. Volatilization from a wet surface(2). Dropped to 20% of original concentration in 8 weeks in water.(2)(D-6). Biologically oxidized to dieldrin, a more stable and at least as toxic form.(2). Sandy loam -- applied at 100 ppm -- 40% remained after 14 years, applied at 25 ppm -- 50% loss in >4 years.(M-5) Transported with the sediments.(M-7) 90% disappeared in soil in 221 - 2248 days (G-2) 60% photolysis in 1 month (G-3).

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 1.6 X 10^4 (G-13)

BIOACCUMULATION POTENTIAL

Oysters, Mollusks, Clams found to concentrate 350-450 times.(D-31) Magnification factors of 3140 for fish and 44,600 for snails.(R-130) (2)

INHALATION

0.25 mg/m^3

RAT LD_{50}

50 mg/Kg (M-4)
MAC = 4.6 X 10^{-2} ng/l (307)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 1.43 X 10^{-5} VHI = 2.92 X 10^{-2} CWHI = 5.4 X 10^5

CHEMICAL NAME

Ammonia

SYNONYM/OTHER NAMES

SOLUBILITY

531,000 mg/l (S-12)

DENSITY

(S-12) 0.817

WATER CHEMISTRY

(2) Ionizes forming NH_4OM, and $NH_4^{=}$, basic

SOIL ATTENUATION

(2) Some cation exchange with soils

VOLATILITY

(S-12) 10 atm @ 25.7°C

VAPOR DENSITY

(S-12) 0.6

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Biodegrades, degradation rate constant 2.4 X 10^{-2} day $^{-2}$ (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

(2) 0

DISCUSSION

Taste 0.037 mg/l (S-12)

MW: 17.03

8

CHEMICAL NAME

Ammonium acetate and Ammonium sulfate

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

Acetate - 77
Sulfate - 132.14

SOLUBILITY

Acetate - >1,000,000 ppm @ 25°C
Sulfate - 706,000 ppm @ 25°C (2)

DENSITY

Acetate - 1.073 (Sp. Gr.)
Sulfate - 1.769 (Sp. Gr.) (2)

WATER CHEMISTRY

Chloramines formed when chlorinated. At high pH ammonia is given off as gas. No reaction with water.(2)

SOIL ATTENUATION

Ammonium ions subject to selective exchange on natural zeolites.(2)

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Degrades rapidly. Ammonia will be broken down to nitrates by nitrifying bacteria, but after about 5 days. Acetate has a substantial oxygen demand. 79% of theoretical in 1-5 days. Sulfate is slower. The demand will be due to the ammonia, and will be exerted after about 5 days.
Overall degradation rate const. = 3×10^{-2} hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

None (2)

INHALATION

RAT LD_{50}

Acetate - 98 mg/Kg intervenenous
Sulfate - 3000-4600 mg/Kg, oral

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 292 - Acetate (based on intervenous LD_{50})
6.72- sulfate

VHI = N/A Acetate
N/A Sulfate

CHEMICAL NAME

Ammonium Cyanide

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

44.06

SOLUBILITY

Soluble (S-6) → 1000 mg/l

DENSITY

0.79 (Sp. Gr.) (S-6)

WATER CHEMISTRY

Ionizes

SOIL ATTENUATION

Cyanide -- Soils with high iron content may hold CN^-. Ammonium -- microbiologically converted in natural soils. Also taken up by plants.(2)

VOLATILITY

VAPOR DENSITY

10 mm Hg @ 28.6°C; 100 mm Hg @ 0.5°C (S-6)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Cyanide -- biodegradable, slowly. Ammonium -- not persistent, nitrified to nitrates.(2)

OCTANOL/WATER PARTITION COEFFICIENT Kow = 1(G-13)

BIOACCUMULATION POTENTIAL

None (2)

INHALATION

RAT LD_{50} MAC = 0.2 mg/l (307)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = N/A

VHI = N/A

CWHI = 5×10^3

CHEMICAL NAME

Ammonium Methacrylate

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT 103

SOLUBILITY **DENSITY**

High (G-13)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY **VAPOR DENSITY**

Low (G-13)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Bacterial rate constant -- 6×10^{-3} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

$Kow = 10^{-3.6}$ (G-13)

BIOACCUMULATION POTENTIAL

INHALATION **RAT LD_{50}**

ODOR THRESHOLD **TASTE THRESHOLD**

DISCUSSION

DWHI = N/A
VHI = N/A

CHEMICAL NAME

Antimony Pentachloride

SYNONYM/OTHER NAMES

Antimonic Chloride, Antimony Perchloride

MOLECULAR WEIGHT

299.02

SOLUBILITY .

Decomposes in water (1)

DENSITY

2.336 gm/cm^3 @ 20°C (J3)

WATER CHEMISTRY

Hydrolyzes in water to form Sb_2O_5 and HCl. The acid of Sb(v):$H[Sb(OH)_6]$ is the most stable form in natural waters.(1)

SOIL ATTENUATION

Nuetralized by basic soils. Sb undergoes cation exchange with clays.(2)
Kd = 1.4 (G-12)

VOLATILITY

1 mm Hg @ 22.7°C (J1)

VAPOR DENSITY*

EVAPORATION RATE*

ENVIRONMENTAL PERSISTENCE

Hydrolyzes in water to form Sb_2O_5 and HCl. Antimony pentoxide is only slightly soluble.(1)

OCTANOL/WATER PARTITION COEFFICIENT* Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

Concentration factors for antimony-freshwater and marine invertebrates 16,000; freshwater and marine fish, 40. Half-life in total human body = 38 days.

INHALATION

0.5 mg/m^3 as Sb(2)

RAT LD_{50} MAC = 1.45 µg/l (307)

675 mg/Kg (1)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

*Not applicable as this is not an organic molecule.

DWHI = 255 (assuming solubility is same as Antimony Trichloride)
VHI = 632 (TLV)

CHEMICAL NAME

Antimony Trichloride

SYNONYM/OTHER NAMES

Butter of antimony, antimony chloride, and caustic antimony

MOLECULAR WEIGHT

228.11

SOLUBILITY

601.6 gm/100 gm H_2O @ 0°C (S 3)

DENSITY

3.14 gm/cm^3 @ 25°C (S 3)

WATER CHEMISTRY

Reacts readily with H_2O to form HCl. The acid of Sb(v):$H[Sb(OH)_6]$ is the most stable form in natural waters.(2)

SOIL ATTENUATION

Neutralized by basic soils. Sb undergoes cation exchange with clays.(2)
Kd = 1.4 (G-12)

VOLATILITY

1 mm Hg @ 49.2°C (S 1)

VAPOR DENSITY*

EVAPORATION RATE*

ENVIRONMENTAL PERSISTENCE

Gradually hydrolizes to SbOCl. Will soon precipitate out as oxide. Antimony does not remain in natural waters very long.(2)

OCTANOL/WATER PARTITION COEFFICIENT*

Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

Concentration factors for antimony-freshwater and marine invertebrates 16,000; freshwater and marine fish, 40. Half-life in total human body = 38 days.

INHALATION

0.5 mg/m^3 as Sb (2)

RAT LD$_{50}$

MAC = 1.45 µg/l (307)

675 mg/Kg (2)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

*Not applicable as antimony is not an organic molecule.

DWHI = 255

VHI = 316 (TLV)

CWHI = 4.1 X 10^8

CHEMICAL NAME

Aniline

SYNONYM/OTHER NAMES

Aniline-oil, Phenylamine, Aminobenzene, Aminorphen, Kyanol

MOLECULAR WEIGHT

93.12

SOLUBILITY

35,000 ppm @ 25°C (2)

DENSITY

1.022 @ 25°C (Sp. Gr.) (2)

WATER CHEMISTRY

Dissolves into water, will seek the bottom of the water course.(2) Mildly basic (G-1)

SOIL ATTENUATION

Soils of organic content may retain aniline. Clays of high surface area (montmorillonite) will also have some capacity. Presence of acids leads to formation of associated salts.

VOLATILITY

1 mm Hg 2 35°C; 10 mm Hg @ 70°C (2)

VAPOR DENSITY

3.2 (2)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

oxidation rate constant - 3 X 10^{-3}, bacterial 1.4 X 10^{-2} hr^{-1} G-13 Chemically stable (G-1)

Readily biodegradable. 1.5-2.26 lb/lb BOD_5 with sewage seed.

BOD = 68% (G-5)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 7 (G-7) Log Kow = .96 (G-14)

BIOACCUMULATION POTENTIAL

None (2) BCF = 4 (G-5)

INHALATION

TLV = 5 ppm

RAT LD_{50}

750 mg/Kg

ODOR THRESHOLD

2-108 ppm (2)

TASTE THRESHOLD

DISCUSSION

DWHI = 1.33

VHI = 42.1 (TLV)

CHEMICAL NAME

Arsenic

SYNONYM/OTHER NAMES

Gray-Arsenic

MOLECULAR WEIGHT

299.64 (As_4) (E-2)

SOLUBILITY

Arsenic is insoluble, but salts are quite soluble (1)

DENSITY

1.97 gm/cm^3 (2)

WATER CHEMISTRY

$AsO_4^{=}$ most stable form in aerated water. As° and AsH_3 can also exist in very reducing sediments.(2)

SOIL ATTENUATION

Arsenic is strongly held by soils and long in moving through the soil column. Arsenate anions are among the few anions that appear to be held by natural exchange.(2)

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Very persistent in environment. Changes forms readily to move easily through the water column until consumed.(1)

OCTANOL/WATER PARTITION COEFFICIENT Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

Bioconcentration factors can reach 13,000 in oysters, 8600 in lobsters, 27,000 in crabs, and 23,000 in mussels. Half-life in total human body is 280 days.(2) (J-6)

INHALATION

RAT LD_{50} MAC = .02 µg/l (307)

15 mg/Kg (2[APD])

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 9.52 (assuming solubility = 5000 mg/l)

VHI = N/A

CWHI = 2.5×10^8

CHEMICAL NAME

2-Chloro-4-Ethyamino-6-Isopropylamino-s-Triazine, (Atrazine)

SYNONYM/OTHER NAMES

Aatrex, Aatram, Atratol, Bicep, Gesaprim

MOLECULAR WEIGHT

215.7 (4)

SOLUBILITY

33 ppm @ 27°C (M-10)

DENSITY

WATER CHEMISTRY

Some photodegradation to hydroxyatrine in solution.(M-11) Koc = 172, Kd = 25.5 (G-2)

SOIL ATTENUATION

Kd ~5 (M-8) Adsorbed on muck or clay soils; downward movement (leaching) limited; desorbs readily depending on temperature, moisture, and pH. Microbial activity may account for significant degradation in the soil. Loss from photodecomposition/volatilization of little significance.(M-10)

VOLATILITY

v.p. 3.0×10^{-7} mm Hg @ 20°C (M-10)

VAPOR DENSITY

EVAPORATION RATE

Applied at 2 lb/A -- persisted in soil for 17 months.(M-9)

ENVIRONMENTAL PERSISTENCE

Soil persistence >1 year depending on soil. Persistence increases as concentration increases, decreases as temperature decreases. Loss after 16 weeks in clay loam, 24 weeks in silt loam. Transport with both water and sediments. Soil persistence 300-500 days.(M-7) Soil half-life 96-204 days;acid hydrolysis half-life 7 days (G-2) Bacterial degradation rate const. 8×10^{-5} hr^{-1}

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 476 (G-7)

BIOACCUMULATION POTENTIAL

Rapidly degraded in fish.(M-11) Factor - 0 (M-9) BCF = 0 (G-7)

INHALATION

RAT LD_{50}

3080 mg/Kg (M-10)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 3.06×10^{-4}

VHI = N/A

CHEMICAL NAME

Benzo (a) anthracene

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

228

SOLUBILITY

0.011 mg/l (J-23)

DENSITY

WATER CHEMISTRY

No reaction with water, low solubility, exist in water in association with organic matter or colloids.(J-24)

SOIL ATTENUATION

Exists in water in association with organic matter or colloids.(J-24)

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Have been found in coastal bottom sediments. Has been shown to be biologically oxidizable by large populations of mixed cultures of marine and soil bacteria. Is light sensitive. Has BOD_{10} of 0.3% ThOD with activated sludge.(J-26)

OCTANOL/WATER PARTITION COEFFICIENT

Log = 5.63 (J-21)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = N/A

VHI = N/A

⑦ X

CHEMICAL NAME

Benzene

SYMONYM/OTHER NAMES

Benzol, Cyclohexatriene

MOLECULAR WEIGHT

78.11

SOLUBILITY·

0.18 lb/100 lb H_2) @ 25°C (3) 820 ppm (G-5)
1780 ppm (G-7)

DENSITY

0.879 gm/cm^3 @ 20°C (3)

WATER CHEMISTRY

No reaction with water (3)

SOIL ATTENUATION

Soils of high organic content (peat) or clays with large surface areas (montmorillonite) will have limited adsorptive capacity.(2) Koc = 83 (G-7)

VOLATILITY

75.1 mm Hg @ 20°C (J-10)

VAPOR DENSITY

0.020 lb/ft^3 @ 20°C (3)

EVAPORATION RATE

Evaporation half-life 37.5 minutes (3) 14.5 cm/hr (G-5)

ENVIRONMENTAL PERSISTENCE

24% ThOD 5 day freshwater, 29% ThOD 20 day in freshwater. Half-life in top meter of water is estimated as 37.3 min due to evaporation from less than saturated solution.(1) BOD_5 = 45% (G-5)

OCTANOL/WATER PARTITION COEFFICIENT

Log = 2.1(J-32) Kow = 135 (G-7)

BIOACCUMULATION POTENTIAL

Benzene appears to accumulate in tissues that exhibit a high lipid content. Bioconcentration in anchovy gall bladder up to 8450.(J-12) BCF = 19 (G-5)

INHALATION

25 ppm (2)

RAT LD_{50}

5.6 mg/Kg (J-11) MAC = 15 μg/l (307)

ODOR THRESHOLD

0.89 ppm (Lower) (2)

TASTE THRESHOLD

0.5 ppm (Lower (2)

BENZENE (Cont'd.)

DISCUSSION

DWHI = 9.18

VHI = 790 (TLV)

CWHI = 1.2×10^5

CHEMICAL NAME

2 Chloro-4 Nitro Benzoic Acid

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

201.57 (NIOSH)

SOLUBILITY

2 (G-13)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Bacterial degradation rate const. $<3 \times 10^{-4}$ hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

Log Kow = 2.34 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

ODOR THRESHOLD

DISCUSSION

DWHI = 2.1×10^{-5}

VHI = N/A

DENSITY

VAPOR DENSITY

RAT LD_{50}

3150 mg/Kg Oral (NIOSH)

TASTE THRESHOLD

① X

CHEMICAL NAME

4 Chloro-3 Nitro Benzoic Acid

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

201.57 (NIOSH)

SOLUBILITY

2 (G-13)

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Bacterial degradation rate const. $<3 \times 10^{-4}$ hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

Log Kow = 2.34 (G-12)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

4450 mg/Kg Oral (NIOSH)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 3.0×10^{-5}

VHI = N/A

CHEMICAL NAME

p-Chloro Sodium Salt of Benzoic Acid

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

178.55 (NIOSH)

SOLUBILITY ~100,000

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Bacterial degradation const. 1.4 X 10^{-3} hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

Log Kow = -1.51 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

838 mg/Kg IVN (NIOSH)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 4.0

VHI = N/A

CHEMICAL NAME

Benzo Fluoranthene

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

252.32

SOLUBILITY

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

OCTANOL/WATER PARTITION COEFFICIENT

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD$_{50}$

72 mg/Kg TDLO (Subcataneous mouse) (K) (Isomer) (NIOSH)

288 mg/Kg TDLO (Skin adsorption mouse) (J) (Isomer) (NIOSH)

ORDOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = N/A

VHI = N/A

CHEMICAL NAME

Benzo (a) pyrene

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

252.3

SOLUBILITY

0.012 mg/l (J-22)

DENSITY

WATER CHEMISTRY

No reaction with water, low solubility, exist in water in association with organic matter or colloids.(J-24)

SOIL ATTENUATION

Exists in water in association with organic matter or colloids.(J-24)
Adsorption on Calcium Carbonate Kd = 1.35 (G-3)

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Have been found in coastal bottom sediments. Average microbial breakdown of 40% was observed in 200 mg/l solution after 8 days at 28°C. Is light sensitive, has BOD_{10} of 1.7% ThOD.(J-26) Photolysis rate const. 0.019 - 0.022 hr^{-1} (G-3)

OCTANOL/WATER PARTITION COEFFICIENT

Log = 6.04 (J-21)

BIOACCUMULATION POTENTIAL

Bioaccumulates approximately 200 fold in clams, *Rangia cureata* after 24 hour exposure of 30.5 μg/l. Accumulation and biomagnification possibly occurs in plankton and isopod crustacea.(J-26)

INHALATION

RAT LD_{50}

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = N/A

VHI = N/A

CHEMICAL NAME

Benzotrichloride

SYNONYM/OTHER NAMES

α Trichlorotoluene, Phenylchloroform, Benzoic Trichloride

MOLECULAR WEIGHT

195.46

SOLUBILITY

Insoluble in H_2O (S-5) 3×10^{-6} (G-13)

DENSITY

1.38 @ 15.5/15.5°C (S-7)

WATER CHEMISTRY

Hydrolyzes in presence of water (S-5)

SOIL ATTENUATION

VOLATILITY

1 mm Hg @ 45.8°C (S-6)

VAPOR DENSITY

6.77 (S-7)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Hydrolysis rate const. = 1×10^{-2} hr^{1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

Log Kow = 4.03

BIOACCUMULATION POTENTIAL

INHALATION

Rat LD_{LO} - 125 ppm over 4 hrs (NIOSH)

RAT LD_{50}

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = N/A

VHI = 1.05 (LD_{LO})

X

CHEMICAL NAME

Benzyl chloride

SYNONYM/OTHER NAMES

Alpha-chlorotoluene

MOLECULAR WEIGHT

126.59

SOLUBILITY

0.33 gm/100 gm H_2O @ 25°C (2)

DENSITY

1.1026 gm/cm^3 @ 18°C (J-1)

WATER CHEMISTRY

Slowly hydrolyzes to form benzyl alcohol and hydrochloric acid.(1)
Hydrolysis rate = 5 X 10^{-2}/hr

SOIL ATTENUATION

Will be absorbed most strongly in soils with high organic and clay content. Neutralized by alkaline soils.(2)

VOLATILITY

1 mm Hg @ 22°C (J-13)

VAPOR DENSITY

5.23 Kg/m^3 @ 20°C (2)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Not very persistent. Hydrolyzes and by-products degrade or are neutralized naturally. Some volatilization losses can be expected.(2)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = $10^{2.63}$

BIOACCUMULATION POTENTIAL

Should be same as benzyl alcohol (1)

INHALATION

TLV = 1 ppm (S12)

ODOR THRESHOLD

0.05 ppm (S12)

RAT LD_{50}

TASTE THRESHOLD

DISCUSSION

DWHI = N/A

VHI = 263 (TLV)

X

CHEMICAL NAME

Bicycloheptadiene

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

92.1

SOLUBILITY DENSITY

2763 mg/l (G-13)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY VAPOR DENSITY

EVAPORATION RATE

Volatilization rate = $6 \times 10^{-3}/h$ (G-13)

ENVIRONMENTAL PERSISTENCE

Degradation rate = 0 (G-13)

OCTANOL/WATER PARTITION COEFFICIENT Kow = $10^{1.98}$ (G-13)

BIOACCUMULATION POTENTIAL

INHALATION RAT LD_{50}

ODOR THRESHOLD TASTE THRESHOLD

DISCUSSION

X

CHEMICAL NAME

5-Bromo-3 sec-Butyl-6-Methyluracil (Bromacil)

SYNONYM/OTHER NAMES

Hyvar, Krovar, Ureabor, Borocil, Hibor

MOLECULAR WEIGHT

261.1 (4) 8.5 ppm (G-7)

SOLUBILITY

815 ppm (M-10)

DENSITY

1.55 @ 25°C (M-10)

WATER CHEMISTRY

SOIL ATTENUATION

Kd ~5 (M-8) Koc = 71 (G-2)

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Microbial degradation apparently does occur in soils. Loss in soil by photodecomposition/volatilization is negligible. Half-life in soils probably 5-6 months.(M-10) 90% disappears in soil in 205 days (G-2)

OCTANOL/WATER PARTITION COEFFICIENT

Log Kow = .39 (G-13)

BIOACCUMULATION POTENTIAL

Factor - 0 (M-9)

INHALATION

RAT LD_{50}

5200 mg/Kg (M-10)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 4.48×10^{-3}

VHI = N/A

X

CHEMICAL NAME

1,3-Butadiene

SYNONYM/OTHER NAMES

1,3-Butadiene

MOLECULAR WEIGHT

54.1 (E-1)

SOLUBILITY

735 g/10^6 g H_2O (S-7)

DENSITY

0.6211 gm/cm^3 @ 20°C (J-7)

WATER CHEMISTRY

No reaction with water (3)

SOIL ATTENUATION

VOLATILITY

1840 mm Hg @ 21°C (3)

VAPOR DENSITY

0.35 lb/ft^3 @ 20°C (3)

EVAPORATION RATE

Should be high because of high vapor pressure and low solubility.(3)

ENVIRONMENTAL PERSISTENCE

Volatilization rate const. >0.3 hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

Log Kow = 1.99 (G-14)

BIOACCUMULATION POTENTIAL

INHALATION

TLV = 1000 ppm (S12)

ODOR THRESHOLD

4.5 ppm (E-1)

RAT LD_{50}

TASTE THRESHOLD

DISCUSSION

DWHI = N/A

VHI = 484 (TLV)

CHEMICAL NAME

Cadmium

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

112.4

SOLUBILITY

Very low, insoluble (J-16) 20 mg/ℓ

DENSITY

8.642 gm/cm^3 @ 20°C (J-3)

WATER CHEMISTRY

Forms complexes with many different ligands. Solubility usually controlled by carbonate, hydroxide, or sulfide. Only +2 valence state in water.(J-16)

SOIL ATTENUATION

Cadmium is strongly sorbed to clays, muds, humic and organic materials, and the hydrous oxides of iron and manganese. Presence of lime in soils greatly decreases cadmium availability.(J-14)

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Cadmium reaching aquatic systems can be transported from water to aquatic organisms or to sediments. It can be transferred from aquatic prey to either aquatic or terrestrial predators, including man. Since the cadmium compounds found in natural water are not very volatile, the principal path by which they are removed from the water must be sorption to sediment.(J-16)

OCTANOL/WATER PARTITION COEFFICIENT

KOW = 1 (G-13)

BIOACCUMULATION POTENTIAL

Bioconcentration factor reported of 1000 times water concentrations in fish muscle.(J-15)

INHALATION

0.02 mg/m^3 (2)

RAT LD$_{50}$

88 mg/Kg $CdCl_2$, 72 mg/Kg CdO (1)
MAC = .010 ppm (307)

TASTE THRESHOLD

ODOR THRESHOLD

DISCUSSION

DWHI = 3.97×10^{-3}

VHI = N/A

CWHI = 2×10^{3}

CHEMICAL NAME

Cis-N-(Trichloromethyl Thio)-4-Cyclohexene-1,2,-Dicarboximide (Captan)

SYNONYM/OTHER NAMES

SR 406, Orthocide 406, Merpan

MOLECULAR WEIGHT

300.6 (4)

SOLUBILITY

Insoluble (2) <.5 ppm @ 25°C (M-4)

DENSITY

1.740 (2)

WATER CHEMISTRY

Hydrolyzes readily in aquatic environment (2)

SOIL ATTENUATION

Kd ∼30 (M-8)

VOLATILITY

VAPOR DENSITY

<0.01 mm Hg @ 25°C (M-4) 1 x 10^{-6} (G-13) torr

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Effective residual life in water -- two weeks. Soil half-life -- conflicting data: 1-2 days (Griffith and Mathews); no concentration drop in 21 days, residues lasting longer than 65 days (Munnecke, 1958). Will sink to bottom and dissolve very slowly (product as dust or wettable powder). Low chronic hazard due to short residual life. Degraded by bacteria, moisture, sunlight, and alkali.(R-203) (2) Well distributed in soil - T/2 -- 1 to 2 days (Griffith and Matthews, 1969). Applied in heavy concentration on simulating seeds, it persisted -- little concentration change after 21 days. >65 days.(Munnecke, 1958)(M-5) At pH 7.6 half-life at 12°C - 7 hours, at 25°C - 1 hour. Breakdown products not harmful.(M-6) Predominant transport mode is with sediment.(M-7)

OCTANOL/WATER PARTITION COEFFICIENT

KOW = 224(G-7)

BIOACCUMULATION POTENTIAL

Factor of 0 (M-9)

INHALATION

RAT LD$_{50}$

9 gm/Kg (M-18)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 1.59 x 10^{-3}
VHI = N/A

CHEMICAL NAME

1-Naphthylmethylcarbamate (Carbaryl)

SYNONYM/OTHER NAMES

Sevin, Carbaryl, Hexavin, Ravgon, Septene, Tricarnam

MOLECULAR WEIGHT

201.2 (4)

SOLUBILITY

40 ppm;(M-4) 90 ppm (G-7)

DENSITY

1.232 (2)

WATER CHEMISTRY

SOIL ATTENUATION

Kd $\sim 5 \times 10^{2}$ (M-8) KOC = 230(G-7)

VOLATILITY

<0.005 mg Hg @ 26°C (M-4)

VAPOR DENSITY

EVAPORATION RATE Volatilization const = 1.3×10^{-3} hr^{-1} (G-13)

ENVIRONMENTAL PERSISTENCE

Overall degradation rate 6.5×10^{-2} day^{-1} (G-13) Transported by water and sediments.(M-7) Half-life or duration of activity in soils is 2 weeks.(M-9) River water pH 7.3, 95% reduction in one week. Complete degradation by second week.(M-12) Losses mainly by photo and biochemical degradation. Also can occur through volatilization and a minimal amount of leaching.(R-203)

OCTANOL/WATER PARTITION COEFFICIENT KOW = 230 (G-7)

BIOACCUMULATION POTENTIAL

Factor is 0

INHALATION

5 mg/m^3;(2) Toxicity by Inhalation, TLV - 5 mg/m^3 (3)

RAT LD$_{50}$

540 mg/Kg Oral (M-18)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 5.29×10^{-1}

VHI = 4.20×10^{-2} (TLV)

CHEMICAL NAME

3,3-Dihydro-2,2-Dimethyl-7-Benzofuranyl Methylcarbamate (Carbofuran)

SYNONYM/OTHER NAMES

FMC 10242, Furadan

MOLECULAR WEIGHT

221.3 (4)

SOLUBILITY ·

DENSITY

700 ppm @ 25°C (M-4) 415 ppm (G-2)

WATER CHEMISTRY

SOIL ATTENUATION

Kd - 5 x 10^2 (M-8)

VOLATILITY

VAPOR DENSITY

v.p. 2 x 10^{-5} mg Hg @ 33°C (M-4)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Hydrolysis rate const = 4 x 10^{-3} hr^{-1} (G-13)
Transported in water.(M-7) 8-16 weeks half-life or activity duration in soils.(M-9) 95% disappearance in 145-434 days depending on soil pH, moisture, and temperature.(M-20)

OCTANOL/WATER PARTITION COEFFICIENT Kow = 40 (G-7) log Kow = 2.55 (G-13)

BIOACCUMULATION POTENTIAL

Factor is 0 (M-9)

INHALATION

RAT LD_{50}

8-14 mg/Kg Oral (M-4)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 2.5

VHI = N/A

CHEMICAL NAME

Carbon Tetrachloride

SYNONYM/OTHER NAMES

Tetrachloromethane, Perchloromethane

MOLECULAR WEIGHT

153.8

SOLUBILITY

800 mg/l @ 20°C (1)

DENSITY

99.5 lb/ft^3 @ 20°C (3)

WATER CHEMISTRY

No reaction (1)

SOIL ATTENUATION

Adsorption should be proportional to surface area of clays and organic content of soils (2)

VOLATILITY

91 mm Hg (G-8)
1.7 psia @ 20°C (3)
Diffusion in air 0.0828

VAPOR DENSITY

0.050 lb/ft^3 @ 20°C (3)

EVAPORATION RATE

200 ml of CCl_4 solution at concentration of 1 mg/kg had half-life of 29 minutes when stirred at 200 rpm at 25°C (J-20) Volatilization half-life 28 min. (G-8)

ENVIRONMENTAL PERSISTENCE

No BOD, nondegradable. Tends to remain indefinitely at bottom of watercourses (2) Hydrolytic breakdown half-life is 70,000 years. (J-19)

OCTANOL/WATER PARTITION COEFFICIENT

Log Kow = 2.6 (J-9) Kow = 436 (G-7)

BIOACCUMULATION POTENTIAL

Bioaccumulation factor of 17.4 in flesh, 79 in carcass without flesh, 62 in whole body. Trout muscle uptake-depuration ratio (Uptake rate (hr^{-1})/clearance rate (hr^{-1}) = 17.7 ± 2.4) BCF = 18 (G-7)

INHALATION

LC_{50}, 7 hr mouse 7800 ppm (J-17)

RAT LD_{50}

MAC = 2.6 mg/l (307)
4000 mg/Kg MLD (Dog) (J-18)

ODOR THRESHOLD

50 ppm (2)

TASTE THRESHOLD

DISCUSSION DWHI = 5.71 x 10^{-3} CWHI = 3 x 10^5 VHI = 3.07 (LC_{50})

CHEMICAL NAME

Chloral

SYNONYM/OTHER NAMES

Trichloroacetaldehyde

MOLECULAR WEIGHT

147.4

SOLUBILITY

Very soluble (S6) 14,740 mg/ℓ (G-13)

DENSITY

1.505 gm/cm^3 @ 25°C (S-5)

WATER CHEMISTRY

Combines with water to form chloral hydrate.(S-5)

SOIL ATTENUATION

VOLATILITY

35 mm Hg @ 20°C (S-5)

VAPOR DENSITY

5.1 (J-1)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Biodegradation rates: adapted A.S. at 20°C - product is sole carbon source: 86.2% COD removal at 3.3 mg COD/g dry innocculum/hr.(S-12)
Bacterial rate coefficient $<10^{-3}$ (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = $10^{-1.41}$ (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

23 mg/Kg (NIOSH)

ODOR THRESHOLD

0.047 ppm (S-12)

TASTE THRESHOLD

DISCUSSION

DWHI = 6.21

VHI = N/A

X

CHEMICAL NAME

Chloroacetaldehyde

SYNONYM/OTHER NAMES

Chloroaldehyde, 2-Chloro-1-Ethanal

MOLECULAR WEIGHT

78.5

SOLUBILITY

10,000

DENSITY

1.19 gm/cm^3 @ 25°C (40% Solution) (J-29)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

100 mm Hg @ 45°C (40% Solution) (J-29)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE Degradation rate 1 x 10^{-3} hr^{-1} Bacterial (G-13)

OCTANOL/WATER PARTITION COEFFICIENT Kow = $10^{.3}$ (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

TLV - 1 ppm (29)

RAT LD_{50}

23 mg/Kg Oral (NIOSH)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 497 (40% solution)

VHI = 1.32 x 10^4 (assuming 50 mm Hg @ 20°C for 40% solution)

CHEMICAL NAME

Chloroacetic Acid

SYNONYM/OTHER NAMES

Monochloroacetic Acid, Chloroethanoic Acid

MOLECULAR WEIGHT

94.5

SOLUBILITY

100,000 mg/ℓ @ 25°C (1)

DENSITY

1.40 gm/cm^3 @ 20°C (1)

WATER CHEMISTRY

Dissociates, no other reaction (1)

SOIL ATTENUATION

Neutralized by basic soils. Adsorption proportional to organic content of soils.(2)

VOLATILITY

1 torr @ 43°C (G-13)

VAPOR DENSITY

3.91 Kg/m^3 @ 20°C (J-29)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE Bacterial degradation const 2 x 10^{-3} hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT log Kow = .39 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD$_{50}$

76 mg/Kg

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 37.6

VHI = N/A

CHEMICAL NAME

Chloroaniline

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

127.6

SOLUBILITY

10,000 mg/ℓ @ 20°C (para) (S12)

DENSITY

1.213 gm/cm^3 @ 20°C (J-29)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

para 1.5 x 10^{-2} torr @ 20°C (G-13)
1 mm @ 59.3°C (para) (J-29)
meta <0.1 mm @ 30°C

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Oxidation degradation rate 4 x 10^{-3} hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

KOW = 10$^{1.83}$ (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

para - TLV = 0.06 ppm (S12)
meta - TLV = 0.01 ppm (S12)

RAT LD$_{50}$

880 mg/Kg Oral (meta isomer) (NIOSH)
420 mg/Kg Oral (para isomer) (NIOSH)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = meta 0.325 (assuming same solubility as para)
para 0.680

VHI = meta 395 (TLV)
para 65.8 (TLV)

CHEMICAL NAME

Chlorobenzene

SYNONYM/OTHER NAMES

Monochlorobenzene, Benzene chloride, Phenychloride

MOLECULAR WEIGHT

112.56

SOLUBILITY

488 mg/l @ 25°C (1)

DENSITY

1.10578 gm/cm^3 @ 20°C (3)

WATER CHEMISTRY

No reaction with water (3)

SOIL ATTENUATION

Adsorption will be proportional to organic content of soils and surface area of clays. (2)

VOLATILITY

10 mm Hg @ 22°C (2)

VAPOR DENSITY

3.88 (J-1)

EVAPORATION RATE

Evaporation half life = 1.12 hr, 11.5 cm/hr (G-5) (3)

ENVIRONMENTAL PERSISTENCE

About 1.5% ThOD after 5 days with sewage seed. Does not biodegrade well. (J-33) Model ecosystem studies showed that only 30% was degraded by *Oedogonium*, 51% by *Daphnia* and 54% by *Gambusia*. Is very persistent even though it is highly volatile. (2)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 690 (G-7)

BIOACCUMULATION POTENTIAL

Material magnified to relatively high levels in model ecosystem study. Bioaccumulation ratios were 4160 in *oedogonium*, 2790 in *Daphnia*, cd 646 in *Gambusia*. BCF-46 (G-5) BCF-12 (flowing) (G-7) (J33)

INHALATION

75 ppm=TLV (1)

RAT LD$_{50}$

2910 mg/Kg (1)
MAC = 20 μg/l (taste-307)

ODOR THRESHOLD

0.21 ppm (E1)

TASTE THRESHOLD

0.020 ppm (Medium) (2)

DISCUSSION

DWHI = 4.79 x 10^{-3} CWHI = 2.4 x 10^4
VHI = 35.1 (TLV)

CHEMICAL NAME

1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-Hexahydro-4,7-Methanoindene (Chlordane)

SYNONYM/OTHER NAMES

Velsicol 168, Octachlor, Chlordan, Octa-Klor, Chlorogran, Chlor-Kil, Prentox, Penticklor, Corodane, Synklor

MOLECULAR WEIGHT

409.8 (4)

SOLUBILITY

9 ppb @ 25°C (M-13) .056 ppm (G-7)

DENSITY

1.670 (2)

WATER CHEMISTRY

SOIL ATTENUATION

Kd ~5 x 10^4 (M-8)

VOLATILITY

v.p. 1.0 x 10^{-5} mm @ 25°C (M-4)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

River water - 85% of concentration still present in 2 weeks - 8 weeks.(2) Soil - 53% after 1 year, 15% after 3 years.(D-6)(R-105) May persist for at least 14 years at detectable level depending on rate of application and soil. Dehydrohalogenates in alkali, i.e., dichlorinated in presence of alkaline reagents.(1)(2) Mainly transported in the sediment.(7) Photoisomerization of cis-chlordane to photo-cis-chlordate.(M-14) Chlordane isomers metabolized to hydrophilic products, oxychlordane is at least as toxic and persistent.(M-15)

OCTANOL/WATER PARTITION COEFFICIENT

KOW = 4 x 10^4 (G-13)

BIOACCUMULATION POTENTIAL

Eastern oysters exposed to 0.01 ppm concentrated 7300 times in 10 days, fish 1000-3000.(M-16)(2) BCF = 8260 (static) - 11,400 (flowing) (G-7)

INHALATION

0.5 mg/m^3 (2)

RAT LD_{50}

MAC = 1.2 mg/ℓ (307)
500 mg/Kg, About (Variable) (M-18)

ODOR THRESHOLD

2.5 x 10^{-3}-5 x 10^{-4} ppm

TASTE THRESHOLD

DISCUSSION

DWHI = 5.14 x 10^{-4}

CWHI = 9.5

VHI = 6.31 x 10^{-3} (TLV)

CHEMICAL NAME

Chlordene

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

338.9

SOLUBILITY

1.85 mg/l (G-13)

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

1 x 10^{-5} torr @ 25°C (G-13)
Volatilization degradation rate -- 2 x 10^{-3} hr^{-1} (G-13)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Bacterial degradation rate -- 2 x 10^{-3} hr^{-1}.

OCTANOL/WATER PARTITION COEFFICIENT

Kow = $10^{2.78}$ (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = N/A

VHI = N/A

CHEMICAL NAME

Chloro Alkyl Ethers

SYNONYM/OTHER NAMES

Bis (Chloromethyl) Ether (BCME), Chloromethyl Methyl Ether (CMME), Bis (Chloroethyl) Ether (BCEE), Bis (2-Chloroisopropyl) Ether (BCIE)

MOLECULAR WEIGHT

CMME - 80.52;(E-14) BCEE - 143.01;(E-17) BCME - 115.0 (E-18)

SOLUBILITY

They are practically insoluble in water, but miscible with most organic solvents. BCEE - 10,200 mg/l;(E-14)
BCIE - 1,700 mg/l (E-14)

DENSITY

BCEE - 1.213;(#-17) BCME - 1.328;(E-18)
BCIE - 1.11 (E-14)

WATER CHEMISTRY

BCME and CMME unstable in aqueous systems. Half-life for BCME in aqueous solution is 14 seconds.(E-15) They hydrolyze rapidly in water to give relatively innocuous products (HCL, formaldehyde, and methanol).(E-16)

SOIL ATTENUATION

VOLATILITY

BCEE - .71 mm Hg @ 20°C (E-14)
BCIE - .85 mm Hg @ 20°C (E-14)

VAPOR DENSITY

BCME - 3.97 (E-14)
BCEE - 4.93 (E-14)
BCIE - 6.0 (E-14)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

The beta-chloroalkye ethers, because of their relative stability and low water solubility, may have a high tendency to be bioaccumulated.(E-15) BCEE - a bioconcentration factor of 11, was observed during a 14 day exposure of bluegills. The half-life was 4-7 days.(E-17)

INHALATION

CMME Rat - 55 ppm;(E-16)
BCME Rat - 7 ppm (E-16)
TLV of BCME - 1 ppb (E-15) BCEE - 15 ppm (E-14)

RAT LD_{50}

MAC = (BCEE) .42 ng/ℓ (307)
CMME - 0.5 g/Kg Oral (E-14)
BCIE - .24 g/Kg (Single Dose) Oral (E-14
BCEE - 75-105 mg/Kg Oral (Single Dose) (E-14)

ODOR THRESHOLD

BCIE - 0.32 mg/l (E-14)

TASTE THRESHOLD

DISCUSSION

DWHI = 3.89 (BCEE) 0.202 (BCIE)
VHI = 12.4 (BCEE) (TLV)
CWHI = 2.4×10^{10}

CHEMICAL NAME

Chloroform

SYNONYM/OTHER NAMES

Trichloromethane

MOLECULAR WEIGHT 119.4

SOLUBILITY

8200 mg/l @ 25°C (S9)

DENSITY

1.4916 gm/cm^3 @ 18°C (S3)

WATER CHEMISTRY

No reaction with water (3)

SOIL ATTENUATION

Adsorption will be proportional to organic content of soils and surface area of clays.(2)

VOLATILITY

Volatilization half-life = 23.4 min (G-8)
160 mm @ 20°C (3)

VAPOR DENSITY

0.062 lb/ft^3 (3)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Does not degrade well. Will remain on bottom for extended periods of time. Hydrolysis half-life is 18 months in dark and 15 months in light. In seawater studies, 200 hour losses were linear at 40% in light-open, 30% in light-closed, 20% in dark-closed, and 40% in dark-open systems. Appears volatility then photodegradation are important mechanisms. Five day BOD using sewage seed = 0.008 lb/lb.(2)

OCTANOL/WATER PARTITION COEFFICIENT log Kow = 2 (G-8)

Log = 2.0 (S9)

BIOACCUMULATION POTENTIAL

Bioconcentration factor = 6 in fish (S9)

INHALATION

TVL 25 ppm (3)

RAT LD$_{50}$

MAC = 2.1 μg/l (307)
1875 mg/Kg (2)

ODOR THRESHOLD

205-307 ppm (3)

TASTE THRESHOLD

DISCUSSION

DWHI = 0.125 CWHI = 3.9 x 10^6

VHI = 1680 (TLV)

CHEMICAL NAME

Chloronitrobenzene

SYNONYM/OTHER NAMES

Nitrochlorobenzene

MOLECULAR WEIGHT

157.6

SOLUBILITY

Insoluble (Sl) 500 mg/ℓ (G-13)

DENSITY

1.534 gm/cm^3 @ 20°C (Meta) (S-5)
1.520 gm/cm^3 @ 20°C (Para) (S-5)
1.368 gm/cm^3 @ 20°C (Ortho) (S-5)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

VAPOR DENSITY

5.43 (Sax)

EVAPORATION RATE Volatilization rate const = 5×10^{-3}

ENVIRONMENTAL PERSISTENCE

Decomposition by a soil microflora >64 days.(S-12)

OCTANOL/WATER PARTITION COEFFICIENT log Kow = 2.50 (G-14)

BIOACCUMULATION POTENTIAL

INHALATION

TLV - 0.15 ppm (USSR) (S-12)

RAT LD_{50}

5 mg/Kg (Mixed)Oral Human, LD_{LO} (NIOSH)
288 mg/Kg (1,2 Isomer) Oral (NIOSH)
12 µg/m^3 (1,3 Isomer) (Inh. Human, TC_{LO})
350 mg/Kg Oral (NIOSH)
420 mg/Kg Oral (1,4 isomer) (NIOSH)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 5.71×10^{-3}

VHI = 1750 (TLV, assuming vapor pressure same as for 1,2 dichlorobenzene)

CHEMICAL NAME

2-Chlorophenol

SYNONYM/OTHER NAMES

Ortho-Chlorophenol, 1-Chloro-2-Hydroxy Benzene

MOLECULAR WEIGHT

128.56

SOLUBILITY .

28,500 mg/l @ 20°C (S-12)

DENSITY

1.241 gm/cm^3 @ 18°C (S-12)

WATER CHEMISTRY

Undergoes acid dissociation, pka = 8.85 @ 25°C.(J-32)

SOIL ATTENUATION

VOLATILITY

1 mm Hg @ 12.1°C;(S-6) 5 mm Hg @ 38.2 °C (S-6)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Decomposition rate in soil suspensions is 14 days for complete disappearance. 100% removal of 1 mg/l solution in river water after 6 days of acclimatization at 20°C.(S-12) 100% ring degradation of 100 mg/l solution was accomplished in 3 days with acclimated activated sludge.(J-32) UV irradiation produces catechol and/or 2,2-Dihydroxydiphenyl.(J-34) Bacterial degradation rate 2 x 10^{-3} hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT Kow = $10^{2.16}$ (G-14)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

670 mg/Kg (S-12) MAC = 2.1 μg/l (307)

ODOR THRESHOLD

0.33-2 μg/l (J-34)

TASTE THRESHOLD

0.01 ppm (E-1)

DISCUSSION

DWHI = 1.22

VHI = N/A

CWHI = 1.4 x 10^7

X

CHEMICAL NAME

3-Chlorophenol

SYNONYM/OTHER NAMES

Meta-Chlorophenol, 1-Chloro-3-Hydroxybenzene

MOLECULAR WEIGHT

128.56

SOLUBILITY

26,000 mg/l @ 20°C (S-12)

DENSITY

1.268 gm/cm^3 @ 25°C (S-6)

WATER CHEMISTRY

Undergoes acid dissociation, pka - 9.18 @ 25°C.(J-32)

SOIL ATTENUATION

VOLATILITY

1 mm Hg @ 44.2°C (S-6)
5 mm Hg @ 72.0°C (S-6)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Decomposition rate in soil suspensions is >72 days for complete disappearance.(S-12) 100% ring degradation of 100 mg/l solution was accomplished in 2 days with acclimated activated sludge.(J-32) Compounds containing meta substituted chlorine, however, are much more resistant to microbial degradation. Photolysis of 3-chlorophenol produces high yields of resorcinol.(J-34) Bacterial degradation rate 2 x 10^{-3} hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = $10^{2.5}$ (G-14)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD$_{50}$

570 mg/Kg (S-12)

ODOR THRESHOLD

100-1000 µg/l (J-34)

TASTE THRESHOLD

0.01 ppm (E-1)

DISCUSSION

DWHI = 1.30

VHI = N/A

X

CHEMICAL NAME

2-Chloroallyl Diethyldithiocarbamate (CDEC)

SYNONYM/OTHER NAMES

Sulfallate, Vegadex

MOLECULAR WEIGHT

223.8 (4) 92 ppm (G-2)

SOLUBILITY .

92 ppm @ 25°C (M-10)

DENSITY

1.16 @ 25/15.5°C (M-10)

WATER CHEMISTRY

SOIL ATTENUATION

Kd ∿5 x 10^2

VOLATILITY

v.p. 1.8 x 10^{-4} mm @ 25°C (M-10)
2.2 x 10^{-3} mm (G-2)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Transported in water and sediments. Soil persistence is 20-40 days.(M-7) Average persistence is 3-6 weeks. Microbial degradation is not a major factor. Activity is decreased by volatility losses at high temperatures and by ultraviolet photodecomposition.(M-10) Hydrolysis rate 7 x 10^{-4} hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

850 mg/Kg (M-10)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 3.09 x 10^{-3}

VHI = N/A

CHEMICAL NAME

4-Chlorophenol

SYNONYM/OTHER NAMES

Para-Chlorophenol, 1-Chloro-4-Hydroxybenzene

MOLECULAR WEIGHT

128.56

SOLUBILITY

27,100 mg/l @ 20°C (S-12)

DENSITY

1.306 gm/cm^3 @ 20°C (S-6)

WATER CHEMISTRY

Undergoes acid dissociation, pk = 9.42.(J-34)

SOIL ATTENUATION

VOLATILITY

1 mm Hg @ 49.8°C; 5 mm Hg @ 78.2°C (S-6)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Decomposition rate in soil suspensions is 9 days for complete disappearance. 100% removal of 1 mg/l solution in river water after 6 days of acclimatization at 20°C.(S-12) 100% ring degradation of 100 mg/l solution was accomplished in 3 days with acclimated activated sludge.(J-32) Complete dechlorination and aromatic ring degradation was demonstrated with Arthobacter.(J-34) Bacterial degradation rate 2×10^{-3} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

$Kow = 10^{2.42}$ (G-14)

BIOACCUMULATION POTENTIAL

INHALATION

TLV = 0.2 ppm (S12)

RAT LD_{50}

670 mg/Kg (S-12) MAC = 30 μg/l (307)

ODOR THRESHOLD

33-1000 μg/l (J-34)

TASTE THRESHOLD

0.01 ppm (E-1)

DISCUSSION

DWHI = 1.16

VHI = 657 (TLV)

CWHI = 9×10^5

CHEMICAL NAME

Chlorotoluene

SYNONYM/OTHER NAMES

Chloromethyl Benzene

MOLECULAR WEIGHT

126.6

SOLUBILITY ·

Insoluble (S6) <1000

DENSITY

1.07218 gm/cm^3 @ 20°C (Meta) (S-5)
1.066 gm/cm^3 @ 25°C (Para) (S-5)
1.0776 gm/cm^3 @ 25°C (Ortho) (S-5)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

2.7 mm @ 20°C (S-12)

VAPOR DENSITY

4.37 (S-12)
(18.6 g/m^3 @ 20°C)

EVAPORATION RATE Volatilization rate = 0.24 hr^{-1} (G-13)

ENVIRONMENTAL PERSISTENCE

OCTANOL/WATER PARTITION COEFFICIENT log Kow = 3.33

BIOACCUMULATION POTENTIAL

INHALATION

TLV - 50 ppm
16 ppm (inh Human, TC$_{LO}$) (NIOSH)

RAT LD$_{50}$

1231 mg/Kg. Oral (NIOSH)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 2.32 x 10^{-5}

VHI = 14.2 (TLV)

CHEMICAL NAME

3-[p-(p-Chlorophenoxy)phenyl]-1,1-dimethylurea (Chloroxuron)

SYNONYM/OTHER NAMES

Tenoran®, Norex®, C-1933

MOLECULAR WEIGHT

290.7 (M-10)

SOLUBILITY

3.7 ppm @ 20°C (M-4)

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

Kd $\sim 5 \times 10^2$ (M-8) Strongly sorbed on soil particles. Equilibrium with 1 ppm soil solution: 14 μg/g (sandy soil), 40 μg/g (clay loam), and 100 μg/g (Humus soil). Leaching not significant in removing from soil surface. (M-10)
Koc = 4986 (G-2)

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE Volatilization rate 1.2×10^{-3} day^{-1} (G-13)

ENVIRONMENTAL PERSISTENCE Overall degradation rate const = 1.2×10^{-3} day^{-1} (G-13)

Soil persistence is 300-400 days. Transported with the sediments. (M-7) UV source of 300W caused 90% loss in 13 hours. Controlled conditions -- 35% in 18 weeks in sandy loam and 25% loss in 18 weeks in humus soil. (M-10)
Loss of 90% in soil in 55 days (G-2)

OCTANOL/WATER PARTITION COEFFICIENT $K_{ow} = 1.2 \times 10^3$

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD$_{50}$

3700 mg/Kg Oral (M-4)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

Bacteria metabolize chloroxuron to monomethylated, dimethylated, and (4-Chlorophenoxy) aniline derivatives. Under model conditions, photodestruction is rapid (90% in 13 hours). (M-10)

DWHI - 2.86×10^{-5}

VHI - N/A

CHEMICAL NAME

Creosote Oil

SYNONYM/OTHER NAMES

Creosote Coal Tar

MOLECULAR WEIGHT 94-136 (G-13)

SOLUBILITY

Insoluble (M-24) 5000 μg/l (G-13)

DENSITY

1.07 (M-24)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE Bacterial degradation 2×10^{-2} hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

ODOR THRESHOLD

TASTE THRESHOLD

.125 ppb in water

DISCUSSION

DWHI = N/A

VHI = N/A

CHEMICAL NAME

Chromium

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

51.996 (1)

SOLUBILITY

Insoluble (1) → 20 mg/l

DENSITY

7.14 @ 28°C (2)

WATER CHEMISTRY

Trivalent form precipitated as hydrous oxide -- disappears from water column. Hexavalent form does not precipitate at any environmental pH unless reacted with barium. Is reduced to trivalent chromium in presence of soil and organic matter (1).

SOIL ATTENUATION Kd = $0\text{-}10^3$, average is low.

Cr^{+3} retained by clays.(2) Soil pH -- major determinant of uptake.(R-175)

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Chromium may last in insoluble form indefinitely.(2) BOD 62.5 mg/l, 5 days (chromium).(C-1)

OCTANOL/WATER PARTITION COEFFICIENT Kow = 1 (G - 13)

BIOACCUMULATION POTENTIAL

Invertebrates, 2000x; fish, 200x (freshwater).(R-170)

INHALATION

1 mg/m^3 (Chromium) (2)

RAT LD_{50}

MAC = 8 ng/l (307)
1.87 g/Kg as $CrCl_3$ Oral (1)

ODOR THRESHOLD

TASTE THRESHOLD

1.4 ppm (Lower) (Chromium) (C-12)
25 ppm (Upper) (Chromium) (C-12)

DISCUSSION

DWHI = 1.59×10^{-5}
VHI = N/A
CWHI = 2.5×10^{6}

CHEMICAL NAME

Cumene

SYNONYM/OTHER NAMES

Cumol, 2-Phenyl Propane, Isopropylbenzene, Isopropylbenzol (soluble in ethanol and ether)

MOLECULAR WEIGHT

120.19

SOLUBILITY

Insoluble in water, 50 ppm @ 25°C (2)

DENSITY

0.85748 (Sp. Gr.) (2)

WATER CHEMISTRY

Floats in slick on surface. Dissolves at extremely slow rate.(2)

SOIL ATTENUATION

Absorption is proportional to organic content of soil and surface area of clays.(2)

VOLATILITY

4.6 mm Hg @ 25°C, 10 mm Hg @ 38.3°C (2)

VAPOR DENSITY

4.1 (2)

EVAPORATION RATE

Volatilization const = 1.4×10^{-4} hr^{-1} (G-13). Half-life of less-than-saturated solutions is 14.2 minutes due to evaporation. 92% evaporates with the first .01% of water. (2) Overall degradation const = 9.6×10^{-2} day^{-1}. (G-13)

ENVIRONMENTAL PERSISTENCE

Is biodegraded. 40% of theoretical oxygen demand consumed in 5 days. 70% in 20 days. (2)

OCTANOL/WATER PARTITION COEFFICIENT

Log Kow = 3.75 (G-13)

BIOACCUMULATION POTENTIAL

Slow excretion rate--may have accumulative effects--appears unchanged by metabolism so can be passed up by food chain. (2)

INHALATION

50 ppm, ~250 mg/m^3 (2)
4 hour LC_{50} = 8000 ppm

RAT LD_{50}

LD_{50} - 2910 mg/Kg (2)

ODOR THRESHOLD

.008 ppm (very low--sharp penetrating odor) (E-1)

TASTE THRESHOLD

0.25 ppm (2)

DISCUSSION

DWHI = 4.91×10^{-4}
VHI = 0.151 (4 hr LC_{50}) 24.2 (TLV)

CHEMICAL NAME

Cyanohydrins (based on Acetone-Cyanohydrin)

SYNONYM/OTHER NAMES

α-Hyroxy-Isobutyronitrile, 2-Hydroxy 2 Methyl Propanenitrile

MOLECULAR WEIGHT

85.10

SOLUBILITY

10,000 ppm @ 25°C (2)

DENSITY

.932 @ 25°C (Sp.Gr.) (2)

WATER CHEMISTRY

Colorless liquid which will dissolve, releasing CN^- radical strong acid releases HCN. Caustic an also lead to decomposition to HCN and acetone. (2)

SOIL ATTENUATION

As an organic, adsorption goes up with organic content of soil. (Peat) and surface area of clays (montmorillonite). If HCN is produced, acid soils may help suppress release. Basic soils will promote release. Anion exchange is poor. (2)

VOLATILITY

0.8 mm @ 20°C (S-12)

VAPOR DENSITY

2.93 (2)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Hydrolysis rate const $<0.1\ hr^{-1}$. (G-13) Will slowly evolve HCN upon standing. HCN will be quite persistent. (2)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

None noted (2)

INHALATION

TLV = 0.25 ppm (S-12)

RAT LD_{50}

13.3 mg/Kg (2)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 215
VHI = 842 (TLV)

CHEMICAL NAME

Cyclohexane

SYNONYM/OTHER NAMES

Hexamethylene, Hexahydrobenzene, Hexanaphthene

MOLECULAR WEIGHT

84.16 (3)

SOLUBILITY	DENSITY
45 ppm @ 25°C (2)	0.779 (2)

WATER CHEMISTRY

Will float on water surface.(2) No reaction with water.(3)

SOIL ATTENUATION

Adsorption proportional to organic content of soils and surface area of clays.(2)

VOLATILITY	VAPOR DENSITY
v.p. 100 mm @ 25.5°C (S-6) 60 mm @ 14.7°C	2.90 (2)

EVAPORATION RATE Volatilization rate const = 7.2 day^{-1} (G-13)

ENVIRONMENTAL PERSISTENCE

Not subject to rapid biodegradation, may be quite persistent. Intense sunlight will lead to accelerated volatilization.(2)

OCTANOL/WATER PARTITION COEFFICIENT log Kow = 3.44

BIOACCUMULATION POTENTIAL

None (3)

INHALATION	RAT LD_{50}
TLV - 300 ppm (3) 1050 mg/m^3 (2)	29,820 mg/Kg 25 (C-1)

ODOR THRESHOLD 3.56×10^{-2} mg/l in air TASTE THRESHOLD

DISCUSSION

DWHI = 4.31×10^{-5}

VHI = 69.8 (TLV)

CHEMICAL NAME

Cyclopentadiene, Dicyclopentadiene

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

66.10, 132.2

SOLUBILITY

DENSITY

Insoluble in H_2O 132 mg/l (G-13) .805 @ 19/4°C (Sp.Gr.)
Insoluble in H_2O (S-5) 132 mg/l (G-13) .979 @ 20/20°C (Sp.Gr.) (S-5)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

300 @ RT (G-13)
5 mm Hg @ 34.1°C (S-6)
Volatization rate 6×10^{-3} hr^{-1} (G-13)

VAPOR DENSITY

2.28
4.57 (S-12)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

(Dicyclo) Unknown

OCTANOL/WATER PARTITION COEFFICIENT

Kow = $10^{3.14}$ (G-17)

BIOACCUMULATION POTENTIAL

INHALATION

Cyclo TLV = 75 ppm (S-12)
Dicyclo TLV = 20 ppm (S-12)

RAT LD_{50}

.41 g/Kg, oral (S-12) Dicyclo

ORDOR THRESHOLD

.011 - .02 ppm (S-12)(Dicyclo)

TASTE THRESHOLD

DISCUSSION

DWHI = 9.2×10^{-5} (Dicyclo)
VHI = Cyclo 7.01 (assuming P' = 2 mm Hg @ 20°C)
Dicyclo 26.3 (assuming P' = 2 mm Hg @ 20°C)

CHEMICAL NAME

0,0-Diethyl 0-[6-Methyl-2-(1-Methylthyl)-4-Pyrimidenyl] Phosphorothioate (Diazinon)

SYNONYM/OTHER NAMES

G-24480, Basudin, Neocidoc, Nucidol, Diazitol, Sarolix, Spectracide

MOLECULAR WEIGHT

304.3 (4)

SOLUBILITY

40 ppm @ 20°C (M-4)

DENSITY

1.116 (2)

WATER CHEMISTRY

Will sink and dissolve very slowly unless accompanied by wetting agents.(2)

SOIL ATTENUATION

Kd $\sim$50 (M-8)

VOLATILITY

v.p. 1.4×10^{-4} mm Hg @ 20°C (M-4)

VAPOR DENSITY

EVAPORATION RATE

Volatilization const. = 6×10^{-4} hr^{-1} (G-13)

ENVIRONMENTAL PERSISTENCE

Overall degradation const = 3.1×10^{-2} day^{-1}.(G-13) Transported in water and sediments. Will sink and dissolve very slowly unless accompanied by wetting agents. Persistence in soils 9 days-12 weeks. Some obvious variation due to soil moisture (M-7)(2). Half-life pH 7.4 @ 20°C is 155 days. Hydrolysis, decomposition by presence of silty clay. Biochemical action probably minimal compared to chemical hydrolysis. (R-102) Some volatilization can be expected (R-203). Alkaline water half life 6 days; acid half life 0.075 days, 9.6 days anaerobic, .8-45 aerobic (G-2).

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 15 (G-13)

BIOACCUMULATION POTENTIAL

BCF = 35 (G-7)

INHALATION

0.1 TLV (mg/m^3)(ppm) (2)

RAT LD_{50}

76-285 mg/Kg (M-17)
125-435 mg/Kg (D-1)
100-150 mg/Kg (M-18)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 1.14×10^{-2}
VHI = 0.368 (TLV)

CHEMICAL NAME

o-Dichlorobenzene

SYNONYM/OTHER NAMES

1,3 Dichlorobenzene

MOLECULAR WEIGHT

147.01 (S-12)

SOLUBILITY

123 mg/l @ 25°C (S-12)

DENSITY

1.288 @ 20/4°C (Sp. Gr.) (S-12)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

500 mm Hg @ 39°C (S-6)
1 mm Hg @ 12°C

VAPOR DENSITY

5.05 (S-7)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Degradation by Psuedomonas at 200 mg/l @ 30°C. Parent: 100% ring disruption after 96 hours. Mutent: 100% ring disruption after 28 hours.(S-12)

OCTANOL/WATER PARTITION COEFFICIENT

log Kow = 3.4 (S-8)

BIOACCUMULATION POTENTIAL

INHALATION

Rat, LC_{low} is 821 ppm/7 hours (NIOSH)

RAT LD_{50}

500 mg/Kg Oral (NIOSH)
500 mg/Kg (Human) (NIOSH)
MAC = .23 mg/l (307)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 7.03×10^{-3}

VHI = 0.700 (7 hr LC_{LO})

CHWI = 5.4×10^{2}

CHEMICAL NAME

p-Dichlorobenzene

SYNONYM/OTHER NAMES

1,4 Dichlorobenzene, Dowtherm E, Paradow

MOLECULAR WEIGHT

147.01 (S-12)

SOLUBILITY

79 mg/l @ 25°C (S-12)

DENSITY

1.458 @ 20/4°C (Sp. Gr.) (S-12)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

1.8 mm Hg @ 30°C; .6 mm Hg @ 20°C (S-12)

VAPOR DENSITY

5.08 (S-7)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Degradation by Psuedomonas at 200 mg/l @ 30°C. Parent: 100% ring disruption after 92 hours. Mutent: 100% ring disruption after 24 hours.(S-12)

OCTANOL/WATER PARTITION COEFFICIENT

2450 (C-7)

BIOACCUMULATION POTENTIAL

215 (G-7)

INHALATION

TLV 75 ppm (NIOSH)

RAT LD$_{50}$

500 mg/Kg (NIOSH)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 4.51×10^{-3}

VHI = 2.10 (TLV)

CHEMICAL NAME

1,2 Dichloroethane

SYNONYM/OTHER NAMES

Ethylene Dichloride, sym-Dichloroethane

MOLECULAR WEIGHT

98.96

SOLUBILITY

8700 ppm (G-10)

DENSITY

1.2569 (2)

WATER CHEMISTRY

Will sink and slowly dissolve. Stable in water, acid and some active chemicals. With air, moisture and light, becomes dark and acidic. (2)

SOIL ATTENUATION

Adsorption proportional to organic content of soil. (2)

VOLATILITY

61 torr, 60 mm Hg @ 20°C (2) (G-10)

VAPOR DENSITY

3.35 (2)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Highly toxic to anaerobic systems even in minute quantities. 150-500 ppm substrate limiting. $BOD^5 = 0$. $BOD^{10} = 18\%$ (2)

OCTANOL/WATER PARTITION COEFFICIENT

Log Kow = 1.5 (G-10)

BIOACCUMULATION POTENTIAL

BCF = 9. (2)

INHALATION

TLV 50 ppm (S-12)

RAT LD_{50}

MAC = 7 μg/l (307)
770 mg/Kg oral (2)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 0.323
VHI = 72.0 (TLV)
CWHI = 1.2×10^6

CHEMICAL NAME

2,4-Dichlorophenol

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

163.01

SOLUBILITY

4600 mg/l @ 20°C (S-12)

DENSITY

1.383 gm/cm^3 @ 60°C (S-12)

WATER CHEMISTRY

Undergoes acid dissociation, pka = >.68.(J-34)

SOIL ATTENUATION

VOLATILITY

1 mm Hg @ 53.0°C; 4 mm Hg @ 80.0°C (S-6)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Decomposition rate in soil suspensions is 9 days for complete disappearance.(S-12) Warburg respirametric technique showed complete oxidation by Pseudomonas isolated from activated sludge. Complete aromatic ring degradation was accomplished in 5 days by acclimated activated sludge. Photolysis in dilute aqueous solutions at peak wavelength of 253.7 mu was virtually complete within 2 to 40 minutes depending on pH.(J-34)

OCTANOL/WATER PARTITION COEFFICIENT

log Kow = 3.14 (G-14)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

430 mg/Kg (J-34)
MAC = .5 µg/l (307)

ODOR THRESHOLD

0.65-20 µg/l (J-34)

TASTE THRESHOLD

DISCUSSION

DWHI = 0.306
VHI = N/A
CWHI = 9.2 x 10^6

CHEMICAL NAME

2,6-Dichlorophenol

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

163.01

SOLUBILITY

0.279 mg/l (G-13)

DENSITY

WATER CHEMISTRY

Undergoes acid dissociation, pka = 6.80. (J-34)

SOIL ATTENUATION

VOLATILITY

1 mm Hg @ 59.5°C
5 mm Hg @ 87.6°C (S-6)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Oxidation and Bacterial combined rate 1.4×10^{-2} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

$K_{ow} = 10^{2.9}$ (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

MAC = 3 µg/l (307)
390 mg/Kg (J-34)

ODOR THRESHOLD

0.65-20 µg/l (J-34)

TASTE THRESHOLD

DISCUSSION

DWHI = 0.337 (assuming solubility, same as for 2,4-bichlorophenol;
4600 mg/l @ 20°C)

VHI = N/A

CWHI = 9.3×10^{1}

CHEMICAL NAME

2,4-Dichlorophenoxyacetic Acid (2,4-D)

SYNONYM/OTHER NAMES

2,4-D

MOLECULAR WEIGHT

221.0

SOLUBILITY

620 ppm @ 25°C (M-4)

DENSITY

1.565 @ 30°C (M-10)

WATER CHEMISTRY

Rapid hydrolysis in basic waters (esters).(Z-3)

SOIL ATTENUATION

Kd $\sim$1.0 (M-8) Undergoes microbial breakdown in warm moist soil. Minor loss from photodecomposition. Volatilization -- oil soluble amine least volatile.(M-10) Koc = 32, Kd = 1.59 (G-2)

VOLATILITY

0.4 mm Hg @ 160°C (M-4)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Degrades rapidly in water from 1000 ppm to 10 ppb in 30 days, but was detected in sediments 10 months after treatment. (M-5) Soil persistence is 10-30 days (acid, ester, amine). Acid and amine transported with water. Ester transported with sediment. (M-7) Minimum photolysis half-life in water is 14 days (butoxyethyl). Volatilization from waters may be significant. (Z-3) Soil half-life 9.5 - 29 days. (G-2) Degradation half life 1×10^{-3} hr^{-1}. (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

log Kow = 2.81 (G-14)

BIOACCUMULATION POTENTIAL

None for goldfish (acid) (M-9) 150x for sunfish (ester) (M-5) BCF = 0 (G-7)

INHALATION

10 mg/m^3 (2)

RAT LD$_{50}$

500 mg/Kg (ester) (M-4)
375 mg/Kg (acid) (M-18)
805 mg/Kg (sodium salt) (M-18)

ODOR THRESHOLD

0.02 ppm (butyl ester)(Lower);(R-105) 0.1 ppm (propylene glycol butyl ester) (Medium); (R-105) 5.0 ppm (isooctyl ester) (Upper) (R105)

TASTE THRESHOLD

0.01 ppm (Lower) (D-1)

DISCUSSION

DWHI = 4.72×10^{-2}

VHI = 3.16×10^{-2} (assuming $P' = 10^{-3}$ mm @ 20°C) (TLV)

CHEMICAL NAME

Dichloropropane

SYNONYM/OTHER NAMES

Propylene-Dichloride, Propylidene Chloride, 1,1 Dichloropropane, 1,2 Dichloropropane

MOLECULAR WEIGHT

102.9 (3)

SOLUBILITY

2700 ppm @ 25°C (2)

DENSITY

1.200 @ 25°C (Sp. Gr.) (2)

WATER CHEMISTRY

Compound will sink in water and slowly dissolve.(2) No reaction with water.(3)

SOIL ATTENUATION

Adsorption proportional to organic content of soils and surface area of clays.(2) Cis- and trans, 1,3-Dichloropropane can be chemically hydrolized in moist soils to the corresponding 3-Chloro alkyl alcohols.(1)

VOLATILITY

50 mm Hg @ 25°C (2)

VAPOR DENSITY

3.9 (2)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

BOD_{20} is 0 (lb/lb). Not expected to degrade well.(2)

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = 2 (G-14)

BIOACCUMULATION POTENTIAL

Bioaccumulation factor of about 17. Cumulative action and similarity to other pesticides suggests strong accumulative potential.(2) Food chain concentration potential: none.(3)

INHALATION

TLV = 75 ppm (312)

RAT LD_{50}

MAC = 203 µg/l (307)
6500 mg/Kg Oral (2)
1900 mg/Kg Oral (1,2 Isomer; 1, Isomer)(G-9)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

$DWHI = 4.06 \times 10^{-2}$ (1,1 Isomer)
1.19×10^{-2} (1,2 Isomer)
VHI = 175 (TLV)
$CWHI = 1.3 \times 10^{4}$

CHEMICAL NAME

2,3 Dichloropropene

SYNONYM/OTHER NAMES

Dichloropropene, Allylene-Dochloride, Telone

MOLECULAR WEIGHT

110.98

SOLUBILITY

Insoluble (2) → 100

DENSITY

1.22 @ 25°C (Sp. Gr.) (2)

WATER CHEMISTRY

Will sink to the bottom of the water body and remain there.(2) No reaction with water.(3)

SOIL ATTENUATION

Good adsorption on muck. Adsorption proportional to organic content and surface area of clays.(2) 1-3 isomer data, KOC is 26.3; Kd is 2.75.(G-2)

VOLATILITY

VAPOR DENSITY

3.8 (2)

EVAPORATION RATE - 50% after 20 mm, 90% after 63 mm @ 25°C (1 mg/1 solution) (S-12)

ENVIRONMENTAL PERSISTENCE

Not expected to biodegrade very well.(2)

OCTANOL/WATER PARTITION COEFFICIENT - Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

May act similar to chlorinated pesticides and concentrate many times.(2)
Food chain concentration potential: none.(3)

INHALATION

RAT LD_{50}

320 mg/Kg Oral

ODOR THRESHOLD

N/A (3)

TASTE THRESHOLD

DISCUSSION

DWHI = 9×10^{-3}

CHEMICAL NAME

1,2,3,4,10,10-Hexachloro-6,7-Epoxy-1,4,4a,5,6,7,8,8a-Oxtahydro-1,4-Endo, Exo-5,8-Dimethanonaphthalene (Dieldrin)

SYNONYM/OTHER NAMES

Compound 497, Octalox, Panoram D-31

MOLECULAR WEIGHT

381 (M-4)

SOLUBILITY

0.186 mg/l @ 29°C (M-4)
0.25 mg/l @ 25°C (M-2)

DENSITY

1.750 (2)

WATER CHEMISTRY

Highly resistent to biochemical oxidation; affected by strong mineral acids.(2)

SOIL ATTENUATION

Kd $\sim 1 \times 10^4$ (M-8) Adsorption capacity directly proportional to organic content. Heat speeds up degradation.

VOLATILITY

1.78×10^{-7} mm Hg @ 20°C (M-4)
2.7×10^{-6} mm Hg @ 20°C (G-2)

VAPOR DENSITY

EVAPORATION RATE

Evaporation half-life = 12,940 hr @ 25°C (S-12)

ENVIRONMENTAL PERSISTENCE

Applied 100 ppm -- persisted in soil >6 years. Applied 25 ppm -- persisted (50% loss) for 8 years. Applied 100 ppm -- 31% remained after 15 years -- sandy loam.(M-5) 100% remained in river water after 8 weeks.(2)(06) Will not dissolve unless accompanied by wetting agent.(2) Transported with the sediments.(M-7) Half-life in soils 1-2 years.(R-104)

OCTANOL/WATER PARTITION COEFFICIENT

-- Kow = 800 (G-13)

BIOACCUMULATION POTENTIAL

For fish -- 3300 times (trout M-5)(M-9) Mollusks concentrate 70-1800x. (R-95) BCF = 4420 - 5800 (Static) (Slowing) (G-7)

INHALATION

0.25 mg/m^3 (2)

RAT LD_{50}

46-63 mg/Kg Oral (M-4)
MAC 4.4×10^{-5} mg/l

ODOR THRESHOLD

VHI = 2.25×10^{-4}

TASTE THRESHOLD

DWHI 1.43×10^{-4}
CWHI = 4.2×10^9

117

DISCUSSION

Photodieldrin -- major conversion product of dieldrin -- more toxic than dieldrin. A metabolic product of dieldrin by microorganisms.(M-19) 95% disappearance of dieldrin from soils, 12.8 year. 4.5% of applied dieldrin lost to volatilization during first year.(M-20)

CHEMICAL NAME

Diethyl Maleate

SYNONYM/OTHER NAMES

Ethyl Malonate

MOLECULAR WEIGHT

172

SOLUBILITY

12 mg/l (G-13)

DENSITY

1.0687(Sp. Gr.) (S-5)

WATER CHEMISTRY

Soluble in Water (S-5)

SOIL ATTENUATION

VOLATILITY

1 mm Hg @ 40°C (S-7)

VAPOR DENSITY

5.52 (S-7)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE -- Bacterial Degradation Constant = $2 \times 10^{-2}\ hr^{-1}$ (G-13)

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = 1.4 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

3200 mg/Kg Oral

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = .893

CHEMICAL NAME

0,0, Diethyl - Methyl Phosphorodithionate

SYNONYM/OTHER NAMES

Phosphorodithioic acid, Diethyl Methyl Ester

MOLECULAR WEIGHT

200.27

SOLUBILITY → 100

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Related to malathion whose properties are as follows.
Malathion: 90% of dose to soil gone in .56 days.

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

156 mg/Kg oral mouse LD50 (NIOSH)

ORDOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = .0266
Assumed solubility similar to malthion.

CHEMICAL NAME

Dimethylamine

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

45.08

SOLUBILITY

1×10^6 ppm @ 25°C (2)

DENSITY

0.680 @ 6.9°C (Sp. Gr.) (2)

WATER CHEMISTRY

Extremely soluble (2)

SOIL ATTENUATION

Adsorption proportional to organic content of soils and surface area of clays. Will undergo cation exchange with clays in neutral or acid solutions.(2)

VOLATILITY

2 atm @ 25°C; 5 atm @ 53.9°C (2)
1.7 atm @ 20°C (S-12)

VAPOR DENSITY

1.6 (2)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Amines degrade at moderate rate, forming ammonium. No BOD_5 -- no oxygen depletion.(2) BOD_5 = 1.3 mg/l.(A-11)

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = -0.38

BIOACCUMULATION POTENTIAL

None (3)

INHALATION

TLV = 10 ppm (S-12)

RAT LD_{50}

540 mg/Kg
200-299 mg/Kg (Mammals)

ODOR THRESHOLD

0.01-42.5 ppm (2)

TASTE THRESHOLD

0.6 ppm (2)

DISCUSSION

DWHI = 5.29
VHI = 3.40×10^4 (TLV)

CHEMICAL NAME

Dimethyl Disulfide

SYNONYM/OTHER NAMES

Methyldisulfide, Methyldithiomethane, 2,3 Dithiabutane

MOLECULAR WEIGHT

94.19

SOLUBILITY

1000 mg/l (G-13)

DENSITY

1.057 @ 16/4°C (Sp. Gr.) (A-11)
1.0569 @ 25°C (A-8)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

28.6 mm @ 25°C (A-8)

VAPOR DENSITY

3.24 (A-8)

EVAPORATION RATE -- Volatilization Constant = 0.21 day^{-1} (G-13)

ENVIRONMENTAL PERSISTENCE -- Overall Degradation Rate = 4.8×10^{-1} hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = 0.87 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION -- TLV = 5 ppm (S-12)

RAT LD_{50}

ODOR THRESHOLD

0.001 ppm or .005 mg/m^3 (A-11)

TASTE THRESHOLD

DISCUSSION

CHEMICAL NAME

Dimethyl Phosphorothioic Acid

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

142.1

SOLUBILITY **DENSITY**

→ 100 .

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY **VAPOR DENSITY**

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Hydrolysis Rate Constant = 1.9×10^{-3} day^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION **RAT LD_{50}**

ODOR THRESHOLD **TASTE THRESHOLD**

DISCUSSION

CHEMICAL NAME

Dimethyl Dithiophosphoric Acid

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

158.2

SOLUBILITY

DENSITY

→ 100

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Hydrolysis Rate Constant = 1.9×10^{-3} day^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

CHEMICAL NAME

Sym-Dimethylurea

SYNONYM/OTHER NAMES

N-N^1-Dimethylurea, 1,3 Dimethylurea

MOLECULAR WEIGHT

88.11

SOLUBILITY

Soluble in water and alcohol, insoluble in ether. (A-7) $>5 \times 10^4$ mg/l (G-13)

DENSITY

1.14 (Sp. Gr.) (A-7)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE Degradation with Bacteria = 2×10^{-3} hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = -0.49 (G-14)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD$_{50}$

6400 mg/Kg Oral (NIOSH)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 2.08

CHEMICAL NAME

Meta-Dinitrobenzene, 1,3 Dinitrobenzene, Para-Dinitrobenzene, 1,4 Dinitrobenzene

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

168.11

SOLUBILITY

Slightly soluble in water, soluble in ether, chloroform, benzene; Meta - .3 parts/100 parts; Para - .18 parts/100 parts (S-6)

DENSITY

1.546 (Meta) (Sp. Gr.) (A-7)
1.6 (Para) (Sp. Gr.) (A-7)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

Volatile with steam

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Para - biodegradation by a soil innoculium in >64 days. Degradation = 0 (G-13)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = $10^{1.62}$ (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

TLV = 0.15 ppm (S-12)

RAT LD_{50}

27 mg/Kg (Para-Dinitrobenzene) (Cat)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 1.06
VHI = 175 (TLV) (Assuming 0.1 mm @ 20°C)

CHEMICAL NAME

Ortho-Dinitrobenzene

SYNONYM/OTHER NAMES

1,2 Dinitrobenzene, O-Dinitrobenzol, Ortho-Dinitrobenzene

MOLECULAR WEIGHT

168.11

SOLUBILITY

Slightly soluble in cold, more soluble in hot water. Soluble in alcohol and other organic solvents. 2100 ppm @ 25°C (A-3)

DENSITY

1.571 @ 0°/4°C (Sp. Gr.) (A-3)

WATER CHEMISTRY

As solid, the chemical will sink, dissolve very slowly.(a)

SOIL ATTENUATION

Adsorption proportional to organic content of soils and surface area of clays.(2)

VOLATILITY

Volatile with steam (3)

VAPOR DENSITY

.00687 mg/l @ 25°C and 760 mm Hg (1 ppm Vapor) (A-3); 5.79 (2)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE -- Degradation rate = 0 (G-13)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = $10^{1.62}$ (G-13)

BIOACCUMULATION POTENTIAL

Chronic toxicity in all routes, suggests accumulative effects. Chronic sub-lethal exposure toxic.(2)

INHALATION

TLV = 0.15 ppm (S-12)

RAT LD_{50}

27 mg/Kg Oral (Cats) (2)
5-60 mg/Kg (A-10)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 2.22
VHT = 175 (TLV)(Assuming 0.1 mm Hg @ 20°C)

CHEMICAL NAME

Dipropylamine (n-) $(C_2H_5CH_2)_2NH$
(i-) $[(CH_3)_2CH]_2$ NH

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

101.19, 146.1

SOLUBILITY

Soluble (S-6) 10,000 mg/l (G-13)

DENSITY

.739; .722 (Sp. Gr.) (S-6)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY -- 30 mm Hg @ 25°C

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE -- Bacterial Degradation Constant = 4×10^{-3} hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = 1.67 (G-14)

BIOACCUMULATION POTENTIAL

Low toxicity (E-11)

INHALATION -- TLV = 0.5 ppm (S-12)

RAT LD_{50} -- 200-400 mg/Kg (S-12)

ODOR THRESHOLD

.02 ppm (E-1) (amine)

TASTE THRESHOLD

DISCUSSION

DHWI = 7.14
VHT = 1.58×10^4 (TLV)

CHEMICAL NAME

Dipropyl Urea

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

144.2

SOLUBILITY 14,400 mg/l (G-13)

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Bacterial Degradation Constant = 4.8×10^{-2} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 43.7 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

CHEMICAL NAME

O,O-Diethyl-S[2-(Ethylthis)-Ethyl] Phosphorodithioate (Disulfoton)

SYNONYM/OTHER NAMES

Bayer 19639, S-276, Disyston, Dithio-Septox, Ekatine, Frumin, Solvirex

MOLECULAR WEIGHT

274.2 (M-4)

SOLUBILITY

25 ppm (M-4)

DENSITY

WATER CHEMISTRY

Alkaline conditions can lead to hydrolysis.(2)

SOIL ATTENUATION

Kd ~5 x 10^2 (M-8)   Koc = 2132 (G-2)

VOLATILITY

v.p. 1.8 x 10^{-4} mm Hg @ 20°C (M-4)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Overall hydrolysis/bacterial degradation constant = 8 x 10^{-4} (G-13) Persisted about 4 weeks in soil.(M-5) Spillage to water -- liquid likely to sink to bottom sediments where it will soon degrade.(2) Hydrolysis half-life (pH 6, 70°C ethanol) 32 hour.(R-102) Transported with the sediment.(M-7)

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = 0.28 (G-13)

BIOACCUMULATION POTENTIAL

Factor is 0 (M-9)

INHALATION

RAT LD_{50}

2.6-12.5 mg/Kg Oral (M-4)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = .09

CHEMICAL NAME

3-(3,4-Dichlorophenyl)-1,1-Dimethylurea (Diuron)

SYNONYM/OTHER NAMES

Karmex, Marmex

MOLECULAR WEIGHT

233.1 (M-4)

SOLUBILITY

42 ppm @ 25°C (M-4)

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

$Kd \sim 1 \times 10^2$ (M-8) Adsorption increases with clay or organic matter content. Leaching not important disappearance factor in most soils.(M-10) Koc = 485 (G-2)

VOLATILITY

v.p. 3.1×10^{-6} mm @ 50°C (M-4)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE -- Bacterial/hydrolysis degradation constant = 2×10^{-3} hr^{-1} (G-13)

Soil degradation primarily by microbes. Losses by photodecomposition or volatility are usually insignificant unless surface exposure during hot, dry conditions continue for several days to several weeks.(M-10) Moist loam soil -- persisted 3-6 months -- little or no leaching applied at 2 lb/A -- persisted >15 months.(M-5) Transported mainly in the sediments.(M-7) Soil half-life - 156-196 days.(G-2)

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = 2.8 (G-14)

BIOACCUMULATION POTENTIAL

Factor is 0 (M-9)

INHALATION

10 mg/m^3 (2)

RAT LD_{50}

3400 Oral (M-4)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 3.53×10^{-4}

CHEMICAL NAME

Epichlorohydrin

SYNONYM/OTHER NAMES

2-Chloropropylene Oxide, y-Chloropropylene Oxide, 1chlor-2,3-Epoxypropane

MOLECULAR WEIGHT

92.53 (3)

SOLUBILITY

66,000 ppm @ 25°C (2)

DENSITY

1.1761 @ 25°C (Sp. Gr.) (2)

WATER CHEMISTRY

Will sink to bottom of water course and dissolve at moderate rate.(2) Mile reaction with water.(3)

SOIL ATTENUATION

Adsorption proportional to organic content of soil and surface area of clays.(2)

VOLATILITY

20 mm Hg @ 29.0°C;(1) 10 mm Hg @ 16.6°C;(1) 100 mm Hg @ 62°C(1) 400 mm Hg @ 98°C(2)

VAPOR DENSITY

3.3 (2)

EVAPORATION RATE

Rapid (1)

ENVIRONMENTAL PERSISTENCE

Estimated t 1/2 in water is ∿2 days (1)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

High hazard with chronic exposure indicates accumulative effects.(2)
Food chain concentration potential: none.(3)

INHALATION

TLV = 5 ppm (S-12)

RAT LD_{50}

90-260 mg/Kg Oral (1)

ODOR THRESHOLD

10 ppm (3)

TASTE THRESHOLD

DISCUSSION

DWHI = 10.5
VHI = 67.0 (TLV)

CHEMICAL NAME

Ethyl Mercaptan

SYNONYM/OTHER NAMES

Ethanethiol, Thioethyl Alcohol, Ethylthioalcohol, Ethyl Hydrosulfide, Ethyl Sulfhydrate

MOLECULAR WEIGHT

62.13

SOLUBILITY

1.5 parts/100 parts water. Soluble in ether.(S-6)

DENSITY

.83907 @ 20/4°C (S-6)

WATER CHEMISTRY

Slightly acidic

SOIL ATTENUATION

Adsorption proportional to organic content of soils and surface area of clays.(2)

VOLATILITY

100 mm Hg @ -13°C; 440 torr @ 20°C (G-13)

VAPOR DENSITY

2.14

EVAPORATION RATE -- Volatilization Constant = 0.40 day^{-1} (G-13)

ENVIRONMENTAL PERSISTENCE -- Bacterial/Volatilization Rate Constant = 0.02 hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = 1.2 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

4020 ppm for 4 hours (LC_{50}, Rat)
(for Butyl Mercaptan)

RAT LD_{50}

ODOR THRESHOLD

.5 ppb (A-11)

TASTE THRESHOLD

.00019 mg/l (A-11)

DISCUSSION

VHI = 37.9

CHEMICAL NAME

Ethyl Acrylate

SYNONYM/OTHER NAMES

Ethyl Propenoate, Acrylic Acid, Ethyl Ester

MOLECULAR WEIGHT

100.12 (3)

SOLUBILITY .

15,000 ppm @ 25°C (2)

DENSITY

0.923 @ 20°C (3)

WATER CHEMISTRY

No reaction with water -- floats -- slowly polymerizes and sinks.(3)
May hydrolyze slowly to acrylic acid and ethanol.(2)

SOIL ATTENUATION

Adsorption proportional to organic content of soils and surface area of clays.(2)

VOLATILITY

v.p. 29.3 mm @ 20°C (2)

VAPOR DENSITY

3.5 (2)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

BOD sewage seed (freshwater) 28 lb/lb, 5 days; 33 lb/lb, 20 days, acclimation 66/5 days; 79/20 days.(R-118) Heat and light polymerizes chemical slowly to innocuous resin. Biodegradation -- moderate rate.(2)
Bacterial degradation rate = 1 x 10^{-2} hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 10 (G-13)

BIOACCUMULATION POTENTIAL

No accumulation in oral dose to rabbits;(D-5) none.(3)

INHALATION

Short-term - 50 ppm for 15 minutes (3)
TLV - 25 ppm (3)
Limit - 100 mg/m^3 (2)

RAT LD_{50}

1020 mg/Kg (R&H) (2)

ODOR THRESHOLD

Lower - 0.0018 ppm (E-63)
Medium - 0.0067 (E-63)
Upper - 0.0141 (E-63)

TASTE THRESHOLD

DISCUSSION

DWHT = .42
VHI = 308

CHEMICAL NAME

Chloroethane (Ethyl Chloride)

SYNONYM/OTHER NAMES

Hydrochloric Ether, Monochlorethane, Muriatic Ether

MOLECULAR WEIGHT

64.52 (3)

SOLUBILITY

4500 ppm @ 25°C (2)

DENSITY

0.906 @ 12.2°C (3)
0.9214 @ 4°C (M-23)

WATER CHEMISTRY

No reaction with water (3)

SOIL ATTENUATION

Will volatilize quickly and cling to ground as gas.(3)

VOLATILITY

v.p. 1.33 atm @ 20°C (M-23)
1.00 atm @ 12.2°C

VAPOR DENSITY

2.2 (3)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Volatile gas will disperse with time.(2)

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = 1.43 (G-14)

BIOACCUMULATION POTENTIAL

None (3)

INHALATION

2600 mg/m^3 (2)
TLV - 1000 ppm

RAT LD$_{50}$

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

VHI = 2.66

CHEMICAL NAME

Ethylene Diamine

SYNONYM/OTHER NAMES

Diaminoethane, 1,2-Ethanediamine

MOLECULAR WEIGHT

78.12 (Hydrate) (E-14), 60.1 (Annydrous) (E-14)

SOLUBILITY

1,000,000 ppm @ 25°C (2)

DENSITY

0.963 @ 21/4°C (Hydr) (E-14)
0.8994 @ 20/4°C (Anhydr) (E-14)

WATER CHEMISTRY

Will be dissolved in water giving a strongly alkaline solution.(2)

SOIL ATTENUATION

Adsorption proportional to organic content of soils and surface area of clays. In neutral or acid soils, will undergo cationic exchange.(2)

VOLATILITY

116 mm @ 20°C (Anhy.); (E-14)
9 mm @ 20°C (E-14)

VAPOR DENSITY

2.1 (Anhydr.) (E-14)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Up to 75% of theoretical oxygen demand is utilized in first 5 days with an additional 5% available in the next 5 days.(2)
Bacterial Degradation Rate = 6×10^{-3} hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = $10^{-1.2}$ (G-13)

BIOACCUMULATION POTENTIAL

The dissolved amine is readily biodegradable.(2)

INHALATION

TLV of 10 ppm (E-14)

RAT LD_{50}

1.16 g/Kg Acute Oral

ODOR THRESHOLD 1-3.4 ppm in air

TASTE THRESHOLD

DISCUSSION

DWHI = 24.600
VHI = 3,050

CHEMICAL NAME

Ethylene Thiourea

SYNONYM/OTHER NAMES

2-Imidazolid, Nethione, ETU

MOLECULAR WEIGHT

102.

SOLUBILITY -- 2 x 10^3 mg/l (G-13)

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE -- Photolysis Degradation Rate = 2 x 10^{-3} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

TD_{low} 200 mg/Kg oral

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DHWI = .286

CHEMICAL NAME

Ferric Dimethyl Dithiocarbamate (Ferbam)

SYNONYM/OTHER NAMES

Fermate, Ferbeck, Ferradow, Karbam Black

MOLECULAR WEIGHT

416.5 (M-4)

SOLUBILITY

120 ppm (M-4)

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

Strongly held by soils with high organic content.(2)

VOLATILITY

v.p. negligible (M-4)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Applied to soil, persisted for 28 days.(M-5) Decomposes slightly with prolonged exposure to heat, air, and water. Low pH and microbial life material degrades quickly in soil.(2) Transported in the sediments and water.(M-7) Hydrolysis Degradation Rate = 4×10^{-3} hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 14 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

10 mg/m^3(2)

RAT LD$_{50}$

>17,000 mg/Kg Oral (M-4)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 2×10^{-4}
VHI = 0.032 (Assume p' = 10^{-3} mm Hg @ 20°C)

CHEMICAL NAME

Formaldehyde

SYNONYM/OTHER NAMES

Methanal

MOLECULAR WEIGHT

30.03

SOLUBILITY

Miscible (3)

DENSITY

74.6 lb/ft^3 (3)

WATER CHEMISTRY

No reaction with water (3)

SOIL ATTENUATION

Adsorption proportional to organic content of soils and surface area of clays (2)

VOLATILITY

0.027 psia @ 20°C (3)

VAPOR DENSITY

1.32 Kg/m^3 @ 20°C (2)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Five day BOD = 0.3 to 1.06 lb/lb using sewage seed (Theoretical BOD = 1.06 lb/lb). Oxidizes in air to formic acid. Cold temperatures may cause precipitation of trioxymethylene. Biodegrades quite rapidly. (2)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

None, it is a natural metabolic product and is not subject to bioaccumulation. (2)

INHALATION

TLV = 2 ppm (3)

RAT LD_{50}

800 mg/Kg (Oral) (1)

ODOR THRESHOLD

49.9 ppm (Medium) (2)

TASTE THRESHOLD

50.0 ppm (Lower) (2)

DISCUSSION

DWHI = 3.6
VHI = 184

CHEMICAL NAME

Formic Acid

SYNONYM/OTHER NAMES

Methanoic Acid

MOLECULAR WEIGHT

46.03

SOLUBILITY	DENSITY
(1) Miscible	(3) 75.8 lbs/ft^3 @ 20°C

WATER CHEMISTRY

No reaction with water (3)

SOIL ATTENUATION

Neutralized by basic soil. Some adsorption will take place in soils of high organic content (2)

VOLATILITY	VAPOR DENSITY
0.62 psia @ 20°C (3)	0.0050 lb/ft^3 @ 20°C (3)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Bacterial Degradation Constant = .04 hr^{-1} (G-13)
40% of ThOD in 5 days under quiescent conditions, 70% of ThOD in 20 days (2)

OCTANOL/WATER PARTITION COEFFICIENT

Miscible in ethanol (J-2) Log Kow = -0.54 (G-14)

BIOACCUMULATION POTENTIAL

None

INHALATION	RAT LD_{50}
TLV = 5 ppm (3)	4000 mg/Kg (Dog Oral) (1)

ODOR THRESHOLD	TASTE THRESHOLD
20 ppm (512)	

DISCUSSION

DWHT = .71
VHI = 1,690

CHEMICAL NAME

Fumaronitrile

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

116.1

SOLUBILITY

DENSITY

1,000,000 (G-13)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

Volatilization Constant = 4.8×10^{-2} day^{-1} (G-13)

ENVIRONMENTAL PERSISTENCE

OCTANOL/WATER PARTITION COEFFICIENT

0.13 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

CHEMICAL NAME

Furan

SYNONYM/OTHER NAMES

Furfuran, Tetrol, Oxole, Divinylene Oxide

MOLECULAR WEIGHT

68.07

SOLUBILITY ·

Insoluble in water (E-5)
1 x 10^4 mg/l (M-19)

DENSITY

0.938 gm/cm^3 @ 20°C (E-11)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

758 for 31°C (G-13)

VAPOR DENSITY

2.35 Kg/m^3 @ 20°C (J-29)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE -- Oxidation Degradation Rate = .4 hr^{-1}; Volatilization = .03 hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = $10^{1.34}$ (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

TLV - 10 ppm (J-29)

RAT LD_{50}

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

VHI = 19,900

CHEMICAL NAME

Furfural

SYNONYM/OTHER NAMES

Furfurole, 2-Furancarbonal, Furfuraldehyde

MOLECULAR WEIGHT

96.08

SOLUBILITY

83,000 mg/l @ 20°C (S-12)

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

1 mm @ 20°C (S-12)

VAPOR DENSITY

3.31 (S-12)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Bacterial Degradation Constant = 0.03 hr^{-1} (G-13)
BOD_5 - 0.77 standard dilution sewage. BOD_5 - 0.28 @ 440 ppm (S-12)

OCTANOL/WATER PARTITION COEFFICIENT

Log Kow = 0.34 (G-14) Log Kow = 0.88

BIOACCUMULATION POTENTIAL

INHALATION

TLV = 5 ppm (S-12)

RAT LD_{50}

500 mg/Kg (S-12)

ODOR THRESHOLD

0.25 ppm (S-12)

TASTE THRESHOLD

4 ppm (S-12)

DISCUSSION

DWHI = 4.74
VHI = 52.6 (TLV)

CHEMICAL NAME

Heptachloro-Tetrahydro-4,7-Methanoindene (Heptachlor)

SYNONYM/OTHER NAMES

E-3314, Velsicol 104, Drinox®, Heptagran®, Heptalube®

MOLECULAR WEIGHT

374 (M-4)

SOLUBILITY .

0.056 mg/l @ 25°C (M-4)

DENSITY

1.580 (2)

WATER CHEMISTRY

Stable to hydrolysis but volatilizes and is subject to catalytic decomposition.(2)

SOIL ATTENUATION

Kd $\sim 1 \times 10^4$ Adsorption directly proportional to organic content.(M-8)

VOLATILITY

v.p. 3×10^{-4} mm @ 25°C (M-4)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Applied at 20 lb/A -- persisted >9 years. 16% remained in sandy loam after 14 years (10 ppm application).(M-5) Half-life in soils is 7-12 years.(R-104) River water -- none remained at end of two weeks.(D-6) Transported with the sediments.(M-7)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 8×10^3 (G-13)

BIOACCUMULATION POTENTIAL

Oyster concentrated 17,600x, bluegill 314x (M-5) BCF = 2150-17,400 (G-7)

INHALATION

0.5 mg/m^3

RAT LD$_{50}$

130-135 mg/Kg Oral (M-4)
MAC = .23 ng/l (307)

ODOR THRESHOLD .02 ppm in water

TASTE THRESHOLD

DISCUSSION

Oxidation to stable and more toxic epoxide in plant and animal tissue. Photodecomposition of heptachlor to photoheptachlor. Heptachlor can also be biologically converted to chlordene and other much less toxic substances.(1)

DHWI = 1.23×10^{-5}
VHI = .19
CWHI = 2.4×10^5

CHEMICAL NAME

Hexachlorobenzene

SYNONYM/OTHER NAMES

Perchlorobenzene

MOLECULAR WEIGHT

284.78 (E-5)

SOLUBILITY

Soluble in benzene and boiling alcohol (E-11) 0.035 ppm (G-5)

DENSITY

3.823 (Sp. Gr.) (E-5)

WATER CHEMISTRY

Virtually insoluble in water (E-8)

SOIL ATTENUATION

VOLATILITY

1.089×10^{-5} mm Hg @ 20°C (E-9)

VAPOR DENSITY

9.8 (E-7)

EVAPORATION RATE -- 2.32 cm/hr (G-5)

ENVIRONMENTAL PERSISTENCE

Very stable -- unreactive compound does not apparently undergo photochemical reactions in the atmosphere, nor is it hydrolyzed in aqueous solutions. (E-9) Soil half-life is 2 years (G-4)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 168,000 (G-7)

BIOACCUMULATION POTENTIAL -- BCF = 7880 (G-5)

INHALATION

TLV = 0.08 ppm (S-12)

RAT LD_{50} MAC = 1.2 mg/l (307)

50 mg/Kg/day for 30 days, 60% Mortality, Oral (E-9)

3500, Oral (G-4)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DHWI = 2.0×10^{-5}
VHI = 3.58×10^{-2} (TLV)
CWHI = 2.8×10^{4}

45

CHEMICAL NAME

Hexachlorobutadiene

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

260.74

SOLUBILITY

5 µg/l @ 20°C; soluble in alcohol and ether (E-10)

DENSITY

1.675 (15.5/15.5°C)(Sp. Gr.) (E-11)

WATER CHEMISTRY

Insoluble in water (E-11)

SOIL ATTENUATION

Seems to be rapidly adsorbed to soil and sediment from contaminated water and is known to concentrate in sediment from water by a factor of 100.(E-11)

VOLATILITY

.15 mm Hg (E-10)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

OCTANOL/WATER PARTITION COEFFICIENT -- Kow 4 x 10^4 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

TLV = 1 ppm (S-12)

RAT LD_{50}

90 mg/Kg Oral (NIOSH)
MAC = .77 µg/l (307)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 3.2 x 10^{-3}
VHI = 39.4 (TLV)
CWHI = 6.5

CHEMICAL NAME

Hexachlorocyclopentadiene

SYNONYM/OTHER NAMES

Perchlorocyclopentadiene

MOLECULAR WEIGHT

273 (S-12)

SOLUBILITY

27.3 mg/l (G-13)

DENSITY

1.717 @ 15/15°C (Sp.Gr.) (S-5)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

.08 mm Hg @ 25°C (S-12)

VAPOR DENSITY

9.42 (S-12)

EVAPORATION RATE -- Volatilization 1.6 x 10^{-3} hr^{-1} (G-13)

ENVIRONMENTAL PERSISTENCE -- Hydrolysis Rate = 2 x 10^{-3} hr^{-1}

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = $10^{3.99}$ (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

TLV = 0.01 ppm (S-12)

RAT LD_{50}

MAC = 1 µg/l (307)
505 mg/kg; Rats, Rabbits: single
oral dose: lethal: .42-.62 g/kg (S-12)
113, Oral (G-9)

ODOR THRESHOLD

.0016 - .0014 mg/l (S-12)

TASTE THRESHOLD

DISCUSSION

DWHI = 5.7 x 10^{-4}
VHI = 2100 (TLV)
CWHI = 2.7 x 10^{4}

CHEMICAL NAME

Hexachloroethane

SYNONYM/OTHER NAMES

Carbon Trichloride, Carbon Hexachloride, Perchloroethane

MOLECULAR WEIGHT

236.74 (E-5)

SOLUBILITY

Soluble in alcohol and ether (E-11)
50 ppm (G-8)

DENSITY

2.091 @ 20°C (Sp. Gr.) (E-5)

WATER CHEMISTRY

Insoluble in water (E-11)

SOIL ATTENUATION

VOLATILITY

1 mm Hg @ 32.7°C (E-2)

VAPOR DENSITY

EVAPORATION RATE -- Volatilization half-life = 45 min (G-8)

ENVIRONMENTAL PERSISTENCE

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 18 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

TLV of 1 ppm (E-7); 10 mg/m^3 air (E-7)

RAT LD_{50} MAC = 5.9 µg/l (307)
MLD i.v. in dogs - 325 mg/kg (E-12)
Oral LD_{LO} in humans - 50 mg/Kg (NOISH)

ODOR THRESHOLD 0.01 mg/l in water

TASTE THRESHOLD

DISCUSSION

DWHI = 2.9×10^{-2}
VHI = 263
CHWI = 8.5×10^{3}

CHEMICAL NAME

Hexachlorophene

SYNONYM/OTHER NAMES

Hexosan, 22^1-Methylene-Bis(3,4,6-Trichlorophenol), (G-11)

MOLECULAR WEIGHT

406.9

SOLUBILITY 4×10^{-3} mg/l (G-13)

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE -- Oxidation Degradation Rate = 1.4×10^{-2} hr^{-1} (G-13)
60-70% removal in sewage treatment plant.(G-11)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = $10^{7.54}$,(G-14) $10^{8.83}$ (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD$_{50}$

60 mg/Kg Oral (J-30)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 1.9×10^{-6}

CHEMICAL NAME

Hydrofluoric Acid

SYNONYM/OTHER NAMES

Hydrogen Fluoride, Fluorhydric Acid

MOLECULAR WEIGHT

19.91

SOLUBILITY

1×10^6 ppm @ 25°C (2)

DENSITY

0.989 liquid (Sp. Gr.)
at 13.6°C (2)

WATER CHEMISTRY

No reaction with water -- ionization. Sinks and mixes with water. Harmful vapor produced.(3)

SOIL ATTENUATION

Basic soils will neutralize. Little or no anion exchange will occur to hold up fluoride. Soil combines fluoride tightly if pH is >6.5. High calcium content will also immobilize fluorides.(2) Sorbs on iron oxides.

VOLATILITY

358 mm @ 0°C (2)

VAPOR DENSITY

0.71 (2)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Natural alkalinity will slowly dissipate acidity. Calcium fluoride insoluble.(2)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

None (3)

INHALATION

RAT LD_{50}

LC_{50} - 1310 ppm inhaled 1 hour (2)

ODOR THRESHOLD

0.03 mg/m^3 (2)

TASTE THRESHOLD

<.1 mg/1 (A-3)

DISCUSSION

DWHI = 21.8

CHEMICAL NAME

Hydrocyanic acid HCN

SYNONYM/OTHER NAMES

Hydrogen cyanide, formonitrile, HCN, prussic acid

MOLECULAR WEIGHT

27

SOLUBILITY

1×10^6 ppm @ 25°C (2)

DENSITY

.687 (Sp.Gr.)

WATER CHEMISTRY

Solubilizes and ionizes with heat evolution miscible in water. - not a strong acid, remains undissociated at low pH.

SOIL ATTENUATION

basic soils will neutralize soils of high iron content may hold cyanide (2)

VOLATILITY

546 mm Hg @ 18°C
360 torr 7°C
658.7 torr 21.9°C
100 mm Hg 17.8°C (2)

VAPOR DENSITY

0.93 (2)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Natural alkalinity will slowly reduce acidity. HCN gas will dissipate over a period of time. (2)

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = -0.25

BIOACCUMULATION POTENTIAL

has no accumulative effects (2)

INHALATION

TLV = 10 ppm (S-12)

RAT LD_{50}

544 ppm ih.
mice 4 mg/Kg Oral
cat 2-4
dog 1.7
rabbit 1.1-3.0
g. pig .1
lethal dose - man .5 - 1.5 mg/Kg
MAC + 0.2 mg/l (307)

ORDOR THRESHOLD

1.0 ppm (2)

TASTE THRESHOLD

.001 ppm (2)

DWHI = 52.5; VHI = 1.44×10^4 (TLV); CWHI = 2×10^7

CHEMICAL NAME

Hydroquinone

SYNONYM/OTHER NAMES

1,4 Benzenediol, p-Dihydroxybenzene, Pyrogentistic Acid, Quinole, Hydroquinole

MOLECULAR WEIGHT

110.1

SOLUBILITY

500,000 ppm @ 25°C (2)

DENSITY

1.328 @ 15°C (A-1)

WATER CHEMISTRY

Under alkaline conditions, hydroquinone is easily oxidized to quinone. In acidic solutions, it is very resistant to oxidation.(A-1)

SOIL ATTENUATION

Absorption proportional to organic content of soil and surface area of clays.(2)

VOLATILITY

1 mm @ 132°C; 60 mm @ 203°C (2)

VAPOR DENSITY

3.81 (2)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

0.75 lb O_2/lb hydroquinone in first 5 days. Biodegrades at a moderate rate once bacteria become acclimated.(2)

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = 0.55

BIOACCUMULATION POTENTIAL

Unlikely (A-1)

INHALATION

TLV = 0.44 ppm (S-12)

RAT LD_{50}

LC_{50} - 320-400 mg/Kg (2)

ODOR THRESHOLD

>.2-.4 mg/l (2)

TASTE THRESHOLD

>.2-.4 mg/l

DISCUSSION

DWHI = 39.7
VHI = 59.8 (Assume p' = 0.1 mm Hg @ 20°C)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 3.3×10^{-7}
CWHI = 2

CHEMICAL NAME

Lead

SYNONYM/OTHER NAMES

Plumbum

MOLECULAR WEIGHT

207.19

SOLUBILITY

Dependent on CO_2 concentration and pH. At pH 7-8, .001-.01 mg/l, at pH 6.5 with low alk, lead solubility could reach 100 μg/l.(2)

DENSITY

11.34 (Sp. Gr.) (2)

WATER CHEMISTRY

Lead is stable in oxygenated water as carbonate, hydroxide, or carbonate-hydroxide salts. Under reducing conditions in the presence of sulfur, lead sulfide predominates.(2)

SOIL ATTENUATION

Lead will undergo good cationic exchange with clays. Soil organic matter, pH, and phosphate content control lead mobility. Effluent with 173 mg/l Pb has been noted to undergo a 98% reduction in 3 inches of soil. Soil has a good capacity to absorb lead because lead forms strong complexes with humic matter. Pb concentration should not exceed 2 ppm as soluble form in soil - phytotoxic. Calcium may counteract some lead toxicity. Lead concentration of up to 1632 ppm in the top 12 inches of soil can be tolerated from the standpoint of accumulation and biomagnification.(2)

VOLATILITY

1 torr - 987°C; 10 torr - 1167°C;
100 torr - 1417°C; 5 mm @ 1099°C (2)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Will slowly be precipitated by natural carbonates.(2)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 2×10^4 (G-13)

BIOACCUMULATION POTENTIAL

Accumulation in bones. Concentration factors of 200 for marine and freshwater plants and invertebrates and 60 for marine and freshwater fish. Half-life in total human body - 1460 days.

INHALATION

0.15 mg/m^3 (2)

RAT LD_{50}

LC_{50} - 438 mg/Kg ipr

MAC = 50 μg/l (307)

CHEMICAL NAME

O,O-Dimethyl Dithiophosphate of Diethyl Mercaptosuccinate (Malathion)

SYNONYM/OTHER NAMES

E14049, Malathon, Malatiozol, Malathiozoo, Emmaton, Karbophos, Chemathion, Malaspray

MOLECULAR WEIGHT

330.4 (M-4)

SOLUBILITY

145 ppm @ 25°C (M-4)

DENSITY

1.23 (2)

WATER CHEMISTRY

Subject to hydrolysis and attack at the sulfur atom. Iron catalyzes decomposition. Hydrolysis half-life (pH 6, 70°C, ethanol) 7.8 hours. Changes by factor of 10 for each pH unit in alkaline solution (pH >8).(R-102) Chemical not biochemical hydrolysis initiates degradation.(R-105)

SOIL ATTENUATION

Kd ∿100 (M-8) Adsorption best in soil with high organic content -- enhanced by metallic clays (2)(R-102) Leaching is viable route of movement.(R-203)

VOLATILITY

v.p. 4×10^{-5} mm Hg @ 30°C (M-4)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Soil persistence is 2 days. 5 lb/A persisted for 8 days (low level remaining ∿3%).(M-5) After two weeks in river water, 10% remained, at 4 weeks none remained.(D-6) Soil persistence is one week.(R-105) Soil life is 4 days.(G-4) Bacterial Degradation Rate = 1×10^{-2} hr^{-1}.Hydrolysis = 7×10^{-3} hr^{-1}(G1

OCTANOL/WATER PARTITION COEFFICIENT

-- Kow = 780 (G-7)

BIOACCUMULATION POTENTIAL

Factor for oysters is 0 (M-9) BCF = 0 (G-7)

INHALATION

15 mg/m^3;(2) Toxicity by Inhalation
TLV - 10 mg/m^3 (3)

RAT LD$_{50}$

1375 mg/Kg Oral (M-4)

ODOR THRESHOLD

1 ppm in water

TASTE THRESHOLD

DISCUSSION

Synergistic effects with its basic hydrolysis products.(G-15)

DWHI = 3.0×10^{-3}
VHI = 8.42×10^{-4}

CHEMICAL NAME

Maleic Acid

SYNONYM/OTHER NAMES

Cis-Butendoic Acid, Maleinic Acid, CIS-1,2-Ethylenedioxycarboxylic Acid, Malenic Acid, Toxilic Acid

MOLECULAR WEIGHT

116.07 (E-5)

SOLUBILITY

Very soluble (2) Misc. (G-13)

DENSITY

1.590 (Sp. Gr.) (2)

WATER CHEMISTRY

Very soluble in water, crystals will sink and dissolve rapidly, dropping solution pH.(2)

SOIL ATTENUATION

Neutralized by basic soils (2)

VOLATILITY

VAPOR DENSITY

4.0 (E-7)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Bacterial Degradation Constant = 0.03 hr^{-1} (G-13)
BOD_5 -- 4.5% theoretical; BOD_1 -- 2.7% theoretical, BOD_5 -- 38 lb/lb using sewage seed; BOD_5 -- .63lb/lb using acclimated seed; BOD_5 -- .77 BOD/TOD (anhydride); COD -- .98 lb/lb.(2) ThOD = 0.83.(S-12) BOD_5= 0.38 Std. Dil. (S-12)

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = -0.58 (G-17)

BIOACCUMULATION POTENTIAL

Biodegrades at moderate rate.(2)

INHALATION

RAT LD_{50}

850 mg/kg as anhydride Oral (2)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = .17

CHEMICAL NAME

Maleic Anhydride

SYNONYM/OTHER NAMES

Cis-Butenedioic Anhydride

MOLECULAR WEIGHT

98.06 (3)

SOLUBILITY

163,000 mg/l @ 30°C (2)

DENSITY

.734 (Sp. Gr.) (2)

WATER CHEMISTRY

Will be dissolved in water, hydrolyzes to maleic acid.(2)

SOIL ATTENUATION

VOLATILITY

1 mm Hg @ 44°C (3)

VAPOR DENSITY

3.4 (3)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Bacterial Degradation Rate Constant = 0.03 hr^{-1} (G-13)
.4-.6 (lb/lb) 5 day BOD (2)

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = -0.58 (G-13)

BIOACCUMULATION POTENTIAL

Biodegrades quite slowly (2)

INHALATION

TLV of .25 ppm (2)

RAT LD_{50}

850 mg/Kg Oral (2)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 5.48
VHI = 1000

CHEMICAL NAME

Maleonitrile

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT -- 116.07

SOLUBILITY -- Misc. (G-13)

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE -- Bacterial Degradation Constant = 9.6×10^{-2} hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = -0.89

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

61 mg/Kg Oral (E-6)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

CHEMICAL NAME

Manganese Ethylene Bisdithiocarbamate (Maneb)

SYNONYM/OTHER NAMES

Dithane M-22, Manzate, Maneba, Manebgan, Maneson, Sopranebe, Trimangol, Vancide

MOLECULAR WEIGHT

265.3 x (M-4)

SOLUBILITY **DENSITY**

Slightly soluble (M-4) → 200 mg/l

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY **VAPOR DENSITY**

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Transported mainly with the sediments. (M-7) Hydrolysis Rate = $>4 \times 10^{-3}$ hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION **RAT LD_{50}**

6750 mg/Kg Oral (M-4)

ODOR THRESHOLD **TASTE THRESHOLD**

DISCUSSION

DWHI = 4.23×10^{-4}

CHEMICAL NAME

Methacrylonitrile ($H_2C = C(CH_3)C \equiv N$)

SYNONYM/OTHER NAMES

2-Cyano Propene, α-Methyl Acrylonitrile, 2-Methyl Propenitrile

MOLECULAR WEIGHT -- 67.09

SOLUBILITY

35,700 ppm @ 25°C (2)

DENSITY

0.805

WATER CHEMISTRY

Will float in a slick and dissolve (2)

SOIL ATTENUATION

Absorption best in soils with high organic content (2)

VOLATILITY

10 mm Hg @ -12.5°C
100 mm Hg @ 32.8°C (S-6)

VAPOR DENSITY

EVAPORATION RATE -- Volatilization Rate Constant = 2.4×10^{-3} hr^{-1} (G-13)
Bacterial Degradation = 2.4×10^{-2} hr^{-1} (G-13)

ENVIRONMENTAL PERSISTENCE

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = $10^{2.4}$ (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

3 mg/m^3

RAT LD_{50}

250 mg/Kg oral

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 4.08
VHI = 10,500

CHEMICAL NAME

Methanol

SYNONYM/OTHER NAMES

Methyl Alcohol, Carbinol, Wood Alcohol, Wood Spirit, Wood Naphtha, Colonial Spirit, Columbian Spirit

MOLECULAR WEIGHT

32

SOLUBILITY

1 x 10^6 ppm 25 °C (2) Miscible

DENSITY

0.7195 (Sp. Gr.) (2)

WATER CHEMISTRY

No reaction in water. Miscible (3)

SOIL ATTENUATION

VOLATILITY

100 mm 21.2°C, 40 mm 5°C (2)

VAPOR DENSITY

1.11 (2)

EVAPORATION RATE -- 5.2 times that of ether.(G-1) Volatilization Constant = .36 day^{-1}(G-13

ENVIRONMENTAL PERSISTENCE -- Degradation Rate Bacterial/Volatilization 2.1 x 10^{-2} hr^{-1} (G-13)

BOD data -- .8-1.1 lb/lb in 5 days. Biodegrades rapidly.(2)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = $10^{0.71}$ (G-1r)

BIOACCUMULATION POTENTIAL

Can accumulate in system -- elimination is slow.(2)

INHALATION

TLV = 200 ppm (S-12)

RAT LD_{50}

5300-6200 mg/Kg - Oral - LC_{50};
9.1 mg/Kg ingested acute oral
toxicity in rats (2)
LD_{50} man - 1400 mg/Kg

ODOR THRESHOLD

100 ppm in air (2)

TASTE THRESHOLD

DISCUSSION

DWHI = 4.93
VHI = 132 (TLV)

CHEMICAL NAME

5-Methyl-N-[(Methylcarbamoyl)-Oxy] Thioacetimidate (Methomyl)

SYNONYM/OTHER NAMES

DuPont 4179, Lannate

MOLECULAR WEIGHT

162.2 (M-4)

SOLUBILITY .

5.8% w/w (M-4); 10,000 ppm (G-2)
58,000 (G-13)

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

Kd ∿5 (M-8)   Koc = 160 (G-7)

VOLATILITY

v.p. 5 x 10^{-5} mm Hg @ 25°C (M-4)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Bacterial/Hydrolysis Rate Constant = 5.8 x 10^{-3} hr^{-1} (G-13)
Primary means of transport unknown.(M-7)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 2 (G-7)

BIOACCUMULATION POTENTIAL -- BCF = 42 (G-7)

INHALATION

RAT LD_{50}

17 mg/Kg Oral (Male) (M-4)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 16.8

CHEMICAL NAME

Methyl Chloride

SYNONYM/OTHER NAMES

Chloromethane

MOLECULAR WEIGHT

50.49 (3)

SOLUBILITY.

400 ppm @ 25°C (2)

DENSITY

0.997 (Sp. Gr.) (3)

WATER CHEMISTRY

Small amount will be dissolved. Slowly hydrolyzes to HCl.(2)

SOIL ATTENUATION

Adsorption proportional to organic content of soils and surface area of clays.(2)

VOLATILITY

760 mm Hg @-24°C (3)

VAPOR DENSITY

3.58 (3)

EVAPORATION RATE

50% evaporation from 1 ppm solution @ 25°C in 27 min.; 90% after 91 min.(S-12)
20.76 second (evaporation half-life)(3)

ENVIRONMENTAL PERSISTENCE

BOD -- 0 (2)

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = 0.91 (G-14)

BIOACCUMULATION POTENTIAL

Will hydrolyze slowly to HCl. Should volatilize fairly rapidly and disperse.(2)

INHALATION

TLV of 100 ppm;(2) 94,000 ppm/
Guinea Pigs/LC_{50} (2)

RAT LD_{50}

MAC = 2 μg/l (307)

ODOR THRESHOLD

10 ppm (E-1)

TASTE THRESHOLD

DISCUSSION

VHI = 2000
DWHI = N/A

CWHI = 2×10^5

CHEMICAL NAME

Methylene Chloride

SYNONYM/OTHER NAMES

Dichloromethane, Methylene Dichloride, Methylene Bichloride

MOLECULAR WEIGHT

84.9 (E-1)

SOLUBILITY

20,000 mg/l @ 25°C (2)

DENSITY

1.3255 (Sp. Gr.) (2)

WATER CHEMISTRY

Soluble in water to a limited extent. Will sink to bottom and dissolve at moderate rate.(2) Stable in water (G-1)

SOIL ATTENUATION

VOLATILITY

350 mm @ 20°C (E-4)

VAPOR DENSITY

2.93 (Air = 1) (E-4)

EVAPORATION RATE

50% evaporation from 1 ppm solution after 20 min., 90% after 70 min.(S-12)
1.8 times rate of ether (G-1)

ENVIRONMENTAL PERSISTENCE

May persist for a long time.(2) Chemically stable in air, light, and water.(G-1)

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = 1.3 (G-10)

BIOACCUMULATION POTENTIAL

Not subject to much biological action because of the level of chlorination.(2)

INHALATION

TLV of 500 ppm;(2) 14,500 ppm 2 hr
LC_{50} mouse;(2) 16,188
ppm 8 hr LC_{50} mouse (2)

RAT LD_{50}

2,600 mg/Kg Oral (2)
MAC = 2 μg/l (307)

ODOR THRESHOLD

214 ppm (E-1)

TASTE THRESHOLD

DISCUSSION

DWHT = .22
VHI = 184
CWHI = 10^7

CHEMICAL NAME

Methyl Methacrylate

SYNONYM/OTHER NAMES

Methacrylic Acid, Methyl-Ester, Methyl-2-Methyl-2-Propenoate

MOLECULAR WEIGHT

100.12 (3)

SOLUBILITY .

Very slightly soluble (2) → 20 mg/l

DENSITY

.936 (Sp. Gr.) (2)

WATER CHEMISTRY

Will float in slick and dissolve slowly (2)

SOIL ATTENUATION

Adsorption proportional to organic content of soils and surface areas of clays.(2)

VOLATILITY

40 mm @ 25.5°C (2)

VAPOR DENSITY

3.4 (2)

EVAPORATION RATE -- Volatilization Constant = 3×10^{-3} hr^{-1} (G-13)

ENVIRONMENTAL PERSISTENCE-- Bacterial Rate = 3×10^{-3} hr^{-1} (G-13)

BOD_{10} -- 47% theoretical using CO_2 evaluation data from sewage seed. BOD_{20-23} -- 42.49% theoretical using CO_2 evaluation measurements. BOD_{22} -- 66% theoretical using CO_2 evaluation from acclimated seed.(2)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = $10^{.79}$ (G-13)

BIOACCUMULATION POTENTIAL

Will biodegrade at moderate rate. Exposed slick will be subject to photochemical attack at the unsaturated bond.(2)

INHALATION

TLV of 100 ppm (2)

RAT LD_{50}

9400 mg/Kg Oral (2)

ODOR THRESHOLD

0.05 ppm (3); .21 ppm (E-1)

TASTE THRESHOLD

DISCUSSION

DWHI = 1.5×10^{-4}
VHI = 105

CHEMICAL NAME

Methyl Paraoxon

SYNONYM/OTHER NAMES

Phosphoric Acid Dimethyl p-Nitrophenyl Ester, Dimethyl p-Nitrophenyl Phosphate

MOLECULAR WEIGHT

247.16

SOLUBILITY

44 mg/l (G-13)

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Bacterial Degradation Constant = .02 hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

Log Kow = 1.28 (G-14)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

3 mg/Kg Oral (NIOSH)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

Oxidized from methyl parathion by chemical, enzymatic, and UV oxidation.
DWHI = .23
Assume solubility is same as parathion.

CHEMICAL NAME

0,0-Dimethyl-O-p-Nitrophenyl Phosphorothioate (Methyl Parathion)

SYNONYM/OTHER NAMES

Dalf, Folidoc M, Metacide, Bladan M, Nitrox 80, Metron, Partron M, Tekwaisa

MOLECULAR WEIGHT

263 (M-4)

SOLUBILITY

55-60 ppm @ 25°C (M-4)

DENSITY

1.358 (2)

WATER CHEMISTRY

Hydrolyzes rapidly (2)

SOIL ATTENUATION

Kd ∿300 (M-8) Leaches from soils.(R-3) Adsorption best with high organic or clay content. Koc =9799 (G-2)

VOLATILITY

v.p. 0.97×10^{-5} mm Hg @ 20°C (M-4)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Transported in water and sediments.(M-1) Persistence in water @ 20°C - 175 days. Applied 5 lb/A persisted 30 days in silt loam soil.(M-5) River water, less than 10% left after 2 weeks, none after 4 weeks.(D-6) 95% disappears from water in 4.4 days.(G-2) Hydrolysis half-life (pH 6, 70°C ethanol) 8.4 hours. Changes by factor of 10 for each pH unit in alkaline waters (>pH 8).(R-102) UV radiation converts thiophosphoryl group to phosphoryl group.(R-203) Degradation Rate Bacterial = .02 hr^{-1} (G-13) Neutral Hydrolysis Rate = .08 hr^{-1} (R-102)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 82 (G-7)

BIOACCUMULATION POTENTIAL

Low (2) BCF = 95 (G-7)

INHALATION

0.2 mg/m^3;(2) Toxicity by Inhalation, TLV - 0.2 mg/m^3 (solid), 100 ppm (solution) (3)

RAT LD_{50}

9-25 mg/Kg Oral (M-4)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = .079
VHI = 2.6×10^{-5}

H-1

CHEMICAL NAME

α Methylstyrene

SYNONYM/OTHER NAMES

1-Methyl-1-Phenyl Ethylene, Methyl Propenyl Benzene

MOLECULAR WEIGHT

118.17 (E-7)

SOLUBILITY

Insoluble in water (E-7)
83 mg/l (G-13)

DENSITY

.9062 (25/25°C) (Sp. Gr.) (E-11)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY -- 7.3 torr @ 20°C (G-13)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE -- Bacterial Degradation Rage = 1.7×10^{-3} hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = $10^{3.33}$ (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

TLV 100 ppm (E-7); LC_{LO} rat, 3000 ppm (NIOSH)

RAT LD_{50}

4900 mg/Kg (NIOSH)

ODOR THRESHOLD

.0052 ppm; .160 ppm (E-1)

TASTE THRESHOLD

DISCUSSION

DWHI = 5.8×10^{-6}
VHI = 6.05

CHEMICAL NAME

Mononitrobenzene

SYNONYM/OTHER NAMES

Oil of Mirbane, Nitrobenzol

MOLECULAR WEIGHT

123.11 (3)

SOLUBILITY .

1900 ppm @ 25°C;(2) moderately soluble in water

DENSITY

1.205 (Sp. Gr.) (2)

WATER CHEMISTRY

Will sink to bottom of water course and slowly dissolve.(2)

SOIL ATTENUATION

Adsorption is proportional to organic content of soils and surface area of clays.(2) Not absorbed on silica.(G-3) Does not biodegrade well. A concentration of 630 ppm is capable of inhibiting sewage organisms 50%.(2) Decomposition by a soil microflora in >64 days.(E-14)

VOLATILITY

.15 torr @ 20°C;(G-13) 1 mm Hg @ 44.4°C (3)

VAPOR DENSITY

4.75 (3)

EVAPORATION RATE

Volatilization = 3×10^{-3} hr^{-1}

ENVIRONMENTAL PERSISTENCE

Bacterial Degradation Rate = 5×10^{-4} hr^{-1}. BOD_5 -- 0 lb/lb with sewage seed. COD -- 1.39 lb/lb.(2)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 62 (G-7)

BIOACCUMULATION POTENTIAL

BCF = 13 (G-5)

INHALATION

RAT LD_{50}

700-799 mg/Kg (Mammals, Oral) (2)
MAC = 30 ug/l (307

ODOR THRESHOLD

5.94 ppm (3)

TASTE THRESHOLD

DISCUSSION

DWHI = .072; VHI = 3.9; CWHI = 6.3×10^4

CHEMICAL NAME

Disodium Ethylenebisdithiocarbamate (Nabam)

SYNONYM/OTHER NAMES

Dithane D-14, Parzate

MOLECULAR WEIGHT

256.4 (M-4)

SOLUBILITY

30% (M-4); 20,000 mg/1 (G-13)

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

Adsorption increases with organic content (2)

VOLATILITY

v.p. negligible (M-4)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Applied 100 ppm to soil -- persisted >20 days.(M-5) Low pH and microbial degradation shorten soil life greatly.(2) Transported mainly in the water.(M-7) Hydrolysis Rate $>4 \times 10^{-3}$ hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 60 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

395 mg/Kg Oral (M-4)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

Unstable in dry crystalline form.(2)
DWHI = 1.45

CHEMICAL NAME

α-Naphthol

SYNONYM/OTHER NAMES

1-Naphthol, 1-Hydroxynaphthalene

MOLECULAR WEIGHT

144.2 (E-7)

SOLUBILITY .

Low solubility, 1000 ppm @ 25°C (2)

DENSITY

1.22 (Sp. Gr.) (2)

WATER CHEMISTRY

Will sink and dissolve very slowly (2)

SOIL ATTENUATION

VOLATILITY

100 mm @ 206°C (2)

VAPOR DENSITY

4.98 (6.44 g/l) (2)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Bacterial/Oxidation Constant = 4 x 10^{-2} hr^{-1} (G-13)
Dissolved species are readily oxidized by natural bacteria. BOD_5 -- 1.8 lb/lb -- sewage seed. BOD_{12} -- 93% theoretical for alpha isomer in river water.(2) Photolysis half-life 7.5 min. (pH 9), 43 min. (pH 8), 60 min. pH 7) (G-3)

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = 2.71 (G-14)

BIOACCUMULATION POTENTIAL

Biodegrades quite rapidly (2)

INHALATION

RAT LD_{50}

9000 mg/Kg Oral
3590 mg/Kg (α isomer) (2)

ODOR THRESHOLD

.01-11.4 ppm (2)

TASTE THRESHOLD

0.5 ppm (α isomer) (2)

DISCUSSION

DWHI = 3.2 x 10^{-3}
7.9 x 10^{-3} for α-isomer

CHEMICAL NAME

Naphthoquinone

SYNONYM/OTHER NAMES

1,4-Naphthaquinone (α),1,2 Naphthoquinone (β)

MOLECULAR WEIGHT

158.16 (E-5)

SOLUBILITY + 200 mg/l

DENSITY

WATER CHEMISTRY

Alpha - very slightly soluble in water. Beta - soluble in water.(E-11)

SOIL ATTENUATION

VOLATILITY

Sublimes at 100°C (NIOSH)

VAPOR DENSITY

5.46 (S-12)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE -- BOD_5 0.81 Std. Dil. Sewage. ThOD = 2.1(S-12)

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = 1.74 (G-14)

BIOACCUMULATION POTENTIAL

INHALATION

TLV = 0.015 ppm (S-12)

RAT LD_{50}

140 mg/Kg (Mouse, Oral) (NIOSH)(LD_{LO}); 250 mg/Kg (1,2-isomer) (Rat, Oral) (NIOSH) (LD_{LO}); 190 mg/Kg (1,4-isomer) (Rat, Oral) (NIOSH)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = .015
VHI = N/A

CHEMICAL NAME

Nicotinonitrile

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

99

SOLUBILITY

→ 100 ·

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Bacterial Degradation Rate = 6×10^{-3}/hr (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

1.62 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

CHEMICAL NAME

Nitrodipropyl Amine

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

146

SOLUBILITY → 1000

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Photolysis rate is 2×10^{-3}/yr (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

$Kow = 10^{-0.2}$ (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

CHEMICAL NAME

Nitrofuran

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

113.07

SOLUBILITY

DENSITY

Very slightly soluble (E-5)
2262 mg/l (G-13)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY -- 0.2 torr @ 25°C

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE -- Photolysis Rate = 2×10^{-3} hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = $10^{1.86}$ (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = N/A
VHI = N/A

CHEMICAL NAME

Nitrophenol

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

139.11 (E-5)

SOLUBILITY

13,500 ppm @ 25°C (2)

DENSITY

1.485 (2)

WATER CHEMISTRY

Will dissolve at moderate rate (2)

SOIL ATTENUATION -- Extensive adsorption on silica (G-3)

VOLATILITY

400 mm @ 191°C (2)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

An acclimated bacterial culture may realize up to 42% theoretical BOD in 94 days.(2)

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = 1.7 (G-14)

BIOACCUMULATION POTENTIAL

Biodegrades at slow rate (2)

INHALATION

RAT LD_{50}

2828 mg/kg 14 day (Ortho)
933 mg/Kg 14 day (Meta)
616 mg/Kg 14 day (Para) (2)

ODOR THRESHOLD 8×10^{11} molecules/cc in air
(for ortho only)

TASTE THRESHOLD

DISCUSSION

DWHI = m, .41
o, .14
p, .62
VHI = N/A

CHEMICAL NAME

Nitrosamines (Group) Based on Diethyl Nitrosamine

SYNONYM/OTHER NAMES

Consider Dinitrosomethylamine

MOLECULAR WEIGHT

Varies depending on compound. Diethyl nitrosamine (DENA) 102.16

SOLUBILITY .

Demn >1000 (S-12)

DENSITY

Varies from .909-1.005 (Sp. Gr.) (1)

WATER CHEMISTRY

SOIL ATTENUATION

Compounds breakdown under acidic conditions (1)

VOLATILITY

5 mm Hg @ 28°C (1)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Low, are rapidly decomposed by sunlight. However, studies indicate nitrosamines can move rapidly through the soil into food crops and into groundwater. The nitrogen-nitrogen bond is resistant to microbial attack in soils and water, and the nitro compounds are persistent in soil, sewage, and lake water. In one study, no degradation of nitrosamines was observed in lake water over a 3.5 month period.(1)

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = -0.57 (diemthyl), 0.48 (Diethyl) (G-14)

BIOACCUMULATION POTENTIAL

Nitrosamines readily metabolize. Carcinogenesis is caused by some active metabolite rather than the nitrosamine itself.(1)

INHALATION

RAT LD_{50} -- MAC = .0092 μg/l (307)
150 mg/Kg (TD_{LO}) (NIOSH)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

Carcinogenic risk assessment for dimethylnitrosamine indicates a lifetime exposure to a concentration in water of .05 mg/l DMN would result in an excess of one human cancer in a population of 10^6.

DWHI = 0.2
CWHI = $>1.1 \times 10^5$

CHEMICAL NAME

Nitrotoluene

SYNONYM/OTHER NAMES

m-Nitrotoluene, O-Nitrotoluene, p-Nitrotoluene, Methyl Nitrobenzene

MOLECULAR WEIGHT

137.14 (E-5)

SOLUBILITY .

498 mg/l @ 30°C in water (Meta) (E-12)
652 mg/l @ 30°C (Ortho) (E-14)
442 mg/l @ 30°C (Para) (E-14)
Miscible with alcohol and ether, ortho and para almost insoluble in water.

DENSITY

o-1.163 @ 20°C (Sp. Gr.) (E-5)
p-1.157 @ 20°C (Sp. Gr. (E-5)
m-1.123 @ 55°C (Sp. Gr.) (E-5)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

1 mm Hg @ 50°C (Ortho) (E-2).1 torr @ 20°C
1 mm Hg @ 50°C (Meta) (E-2) .25 torr @ 25°C
1 mm Hg @ 53°C (Para) (E-2) .1 torr @ 70°C
(G-13)

VAPOR DENSITY

4.72 (Para) (E-14)
4.73 (Meta) (E-14)
0.75 g/m^3 @ 20°C (Ortho) Sat. Conc.(E-14

EVAPORATION RATE -- Volatilization Constant = 5 x 10^{-4} hr^{-1} (G-13)

ENVIRONMENTAL PERSISTENCE -- Dissappearance Rate = 5 x 10^{-4} (G-13) Ortho-bacterial photolysis and Volatilization. Others just volatilization

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = $10^{2.39}$(G-14)

BIOACCUMULATION POTENTIAL

Decomposition by a soil microflora in >64 days (all isomers).(E-14)

INHALATION

TLV of 5 ppm (all isomers) (E-14)

RAT LD_{50}

891 mg/Kg Oral (Ortho) (E-13)
1072 mg/Kg Oral (Meta) (E-13)
2144 mg/Kg Oral (Para) (E-13)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = .013 (Meta); .021 (Ortho); .006 (Para)
VHI = 13.15 (Meta); 5.26 (Ortho); 5.26 (Para)

CHEMICAL NAME

Paraldehyde

SYNONYM/OTHER NAMES

p-Acetaldehyde; 2,4,6 Trimethyl; 1,3,5 Trioxane

MOLECULAR WEIGHT

132.16

SOLUBILITY .

Soluble in water, 12 parts/100 parts H_2O @ 18°C, 120,000 ppm

DENSITY

.9943 @ 20°C (Sp. Gr.) (S-7)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

25.3 mm Hg @ 20°C (S-4)

VAPOR DENSITY

4.55 (S-7)

EVAPORATION RATE -- Volatilization Constant - 5×10^{-4} hr^{-1} (G-13)

ENVIRONMENTAL PERSISTENCE -- Bacterial and Degradation Rate = 5×10^{-4} hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = $10^{1.15}$ (G-13)

BIOACCUMULATION POTENTIAL

Body apparently is able to breakdown 7% of an administered dose within 4 hours.(S-8)

INHALATION

RAT LD$_{50}$ -- 1650 mg/Kg (S-12)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

A depressant drug
DWHI = 2.08

CHEMICAL NAME

O,O-Diethyl-O-p-Nitrophenyl Phosphorothioate (Parathion)

SYNONYM/OTHER NAMES

E-605, Folidol, ACC-3422, Thiophos, Niran, Fosferno, Alkron, Alleron, Etilon, Danthion, Parawet, Phoskil, Nitrostigmine

MOLECULAR WEIGHT

291.3 (M-4)

SOLUBILITY

24 ppm @ 25°C (M-4)

DENSITY

1.267 (2)

WATER CHEMISTRY

Readily hydrolyzed in alkaline solution -- especially vulnerable to attack at sulfur atom; incompatible with solutions of pH >7.5.(2)

SOIL ATTENUATION

Kd ~500 (M-8) Relatively stable below pH 7.(Z-2) Koc = 10,454 (G-2)

VOLATILITY

v.p. 3.78×10^{-5} mm @ 20°C (M-4)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Persistence variable -- dependent on conditions. Transported mainly in the sediment.(M-7) Persistence in water @ 20°C is 690 days. Persisted in soil for 5 years. Applied at 50 lb/A -- 30 days in silt loam soil. (M-5) Oxidized chemically or enzymatically to paraoxon. Half-life about 65-68 hours in river water.(Z-2) Soil half-life is 3.2 days.(G-2) Bacterial Degradation Rate - 4×10^{-3} hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 6400 (G-7)

BIOACCUMULATION POTENTIAL

Factor is 9 (M-9) Fish, 80 times; Mussel, 50 times (M-5) BCF = 335 (G-7)

INHALATION

0.1 mg/m^3 (2)

RAT LD_{50}

3.6-13 mg/Kg Oral (M-4)

ODOR THRESHOLD

0.003 ppm pure (Lower);(R-105)
0.036 ppm technical (Medium)
(R-105)

TASTE THRESHOLD

DISCUSSION

DWHI = .19
VHI = .119

CHEMICAL NAME

Pentachlorobenzene

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

250.34 (E-5)

SOLUBILITY

0.135 ppm (G-7) Very soluble in ether, soluble in hot alcohol.(E-5)

WATER CHEMISTRY

Insoluble in water (E-5)

SOIL ATTENUATION

VOLATILITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 154,000 (G-7)

BIOACCUMULATION POTENTIAL

BCF = 5000 (flowing) (G-7)

INHALATION

ODOR THRESHOLD

0.06 mg/l in water (E-14)

DISCUSSION

DWHI = 1×10^{-4}
CWHI = 2.7×10^{5}

DENSITY

1.834 @ 17°C (Sp. Gr.) (E-5)

VAPOR DENSITY

RAT LD_{50}

MAC = 0.5 μg/l (307)
2000 mg/Kg Oral (TD_{LO}) (NIOSH)

TASTE THRESHOLD

CHEMICAL NAME

Pentachloroethane

SYNONYM/OTHER NAMES

Pentalin

MOLECULAR WEIGHT

202.3

SOLUBILITY

.05 cc gas soluble in 100 g solvent
@ 20°C (S-6) 500 ppm (G-8)

DENSITY

1.673 @ 25°C (S-7)

WATER CHEMISTRY

Insoluble in water (S-6)

SOIL ATTENUATION

VOLATILITY

5 mm Hg @ 27.2°C (S-6)

VAPOR DENSITY

7.2 (S-12)

EVAPORATION RATE -- Volatilization Constant = 0.1 hr^{-1} (G-13)

Evaporation from H_2O @ 25°C of 1ppm solution: 50% after 48 minutes
90% after >140 minutes (S-12)

Volatilization half-life = 48 min. (G-8)

ENVIRONMENTAL PERSISTENCE

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

TLV = 5 ppm (SIL)
4238 ppm for 2 hours

RAT LD_{50}

Dog = 1750 mg/Kg (S-12)

ORDOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 8.16×10^{-3}
VHI = .31 (LC_{50})
263 (TLV)

CHEMICAL NAME

Pentachlorophenol

SYNONYM/OTHER NAMES

Penta, Santophen 20, PCP, Dowicide G

MOLECULAR WEIGHT

266.35

SOLUBILITY

14 ppm (G-7)

DENSITY

1.978 (2)

WATER CHEMISTRY

Sinks and dissolves very slowly. Slightly acidic. pKa = 4.86. No reaction with water.(3) No real tendency to ionize $K_1 = 10^{-6}$ Decomposed in alkaline solution to form sale.(2)

SOIL ATTENUATION

Kd = 8.96.(G-2) Koc = 900.(G-7) Adsorption correlated positively with organic conent of soils, pH, and CEC. Correlated negatively with clay content and P fixation. Leaching is typically high.(2)

VOLATILITY

0.00011 mm Hg @ 20°C (2)

VAPOR DENSITY

EVAPORATION RATE

Nil (G-6)

ENVIRONMENTAL PERSISTENCE

BOD_5 = 0% (G-5) Bacteria inhibited by 4-225 ppm.(2) Requires acclimation to achieve degradation in soil.(2) In water with soil innoculum, degradation took >72 days. Persistence in soil at herbicide doses was 2-4 weeks.(2) Undergoes photolysis.

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 102,000 (G-7)

BIOACCUMULATION POTENTIAL

BCF = 750; BCF = 200 (G-6) Known to accumulate in fish (2) (G-5)

INHALATION

TLV = 0.05 ppm (S-12)

RAT LD_{50}

MAC = 140 μg/l (307)
107 mg/Kg (2) Oral

ODOR THRESHOLD

0.857 (2)

TASTE THRESHOLD

0.857 (2)

DISCUSSION

DWHI = .002
VHI = 0.579 (TLV)
CWHI = 10^2

CHEMICAL NAME

Pentadiene

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

68.12 (E-5)

SOLUBILITY

→ 10

DENSITY

.66 @ 20°C (E-5)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = 1.48

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

CHEMICAL NAME

Phenol

SYNONYM/OTHER NAMES

Carbolic-Acid, Phenic Acid, Phenylic-Acid, Phenyl-Hydroxide, Hydroxybenzene, Oxybenzene

MOLECULAR WEIGHT

94.11

SOLUBILITY

67,000 ppm @ 25°C (2)

DENSITY

Sp. Gr. is 1.071 @ 25°C (2)

WATER CHEMISTRY

Dissolves into water, 6.7 g/100 ml at 16°C, weakly acidic.(2)

SOIL ATTENUATION

In the presence of earth and aquatic plants, phenol will decompose at a rate of 3-5 ppm/day with an accompanying decrease in dissolved oxygen.

The lagooning of water containing 3 mg/l of phenol reduced the phenols to .28 mg/l in 7 days and .02 mg/l in 14 days.

BOD was 39% of theoretical with treatment plant seed.

Under aerobic conditions, a concentration of 1 ppm was found to be biologically dissimilated at 20°C in 1-7 days (at 4°C in 5-19 days). Under anaerobic conditions, dissimilation occurs at a slower rate.(2)

Koc = 5.75 (G-2)

VOLATILITY

.35 mm Hg @ 25°C
20 mm Hg @ 86°C (2)

VAPOR DENSITY

4.137 g/l (2)

EVAPORATION RATE -- 0.00052 cm/hr (G-5)

ENVIRONMENTAL PERSISTENCE

See "Soil Attenuation"

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = 1.5 (G-10)

BIOACCUMULATION POTENTIAL

Factor is 2.3 for fish and shellfish (1) BCF = 8 (G-5)

INHALATION

TLV = 5 ppm (S-12)

RAT LD_{50}

Oral LC_{50} rats: 530 mg/Kg body weight
MAC = 3.4 mg/l (307)

ODOR THRESHOLD

.016-16.7 ppm

TASTE THRESHOLD

.0001

DISCUSSION

DWHI = 3.612
VHI = 18.4 (TLV)
CWHI = 2 x 10^4

CHEMICAL NAME

0,0-Diethyl S-(Ethylthio)-Methyl Phosphorodithioate (Phorate)

SYNONYM/OTHER NAMES

El 3911, Thimet, Dranutox

MOLECULAR WEIGHT

260.4 (M-4)

SOLUBILITY

50 ppm (M-4)

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

Kd ~5 x 10^2 (M-8) Koc = 3199 (G-2)

VOLATILITY

v.p. 8.4 x 10^{-4} mm @ 20°C (M-4)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Bacterial/Hydrolysis Constant = 8 x 10^{-4} hr^{-1} (G-13)
Persisted in soil >23 days.(M-5) Transported in sediment and water.(M-7)
Soil half-life is 1-4 weeks.(G-2)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 18 (G-13)

BIOACCUMULATION POTENTIAL

Factor is 0 for goldfish (M-9)

INHALATION

RAT LD_{50}

1.6-3.7 mg/Kg (tech) Oral (M-4)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI =.893
VHI = N/A

CHEMICAL NAME

O,O Diethyl Phosphorodithioate

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

186

SOLUBILITY

DENSITY

→ 100 .

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Hydrolysis Constant = $1.92 \times 10^{-3}\ hr^{-3}$ (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

Log Kow = 0.45

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = N/A
VHI = N/A

CHEMICAL NAME

Phosphorodithioic Acid, S,S^1-Methylene O,O O^1,O^1-Tetraethyl Ester

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

354

SOLUBILITY

DENSITY

→ 1000 '

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Overall Rate Constant = 1.92×10^{-2} day^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

CHEMICAL NAME

O,O,O, Triethyl phosphorothioate

SYNONYM/OTHER NAMES

Phosphorothioic acid, triethyl ester

MOLECULAR WEIGHT

198.24

SOLUBILITY

→ 1000

DENSITY

1.074 (S-5)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Hydrolysis Rate Constant = $<1.92 \times 10^{-3}$ (G-13)
Related to methyl parathion and parathion whose properties are as follows
Methly parathion - 90% disappears in water solution after 4.4 days.
Parathion - t 1/2 in soil is 32 days (very pH dependent)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

41 ppm over 4 hours LCLO (NIOSH)

RAT LD_{50}

ORDOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = N/A
VHI = N/A

CHEMICAL NAME

Phosphorus Sulphide

SYNONYM/OTHER NAMES

Phosphorous Pentasulfide, Phosphoric Sulfide, Phosphorous Persulfide

MOLECULAR WEIGHT

222.24 (NIOSH)

SOLUBILITY

Decomposes (2) → 1,000,000

DENSITY

2.03 (NIOSH)

WATER CHEMISTRY

Decomposes to Phosphorous Pentoxide and Hydrogen Sulfoxide (2)

SOIL ATTENUATION

Limited exchange of sulfide on soils. Some precipitation as metal salts. Neutralized by bank soils. (2)

VOLATILITY

1mm Hg @ 300°C (2)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE -- Hydrolysis Rate = $>4 \times 10^{-3}$ hr^{-1} (G-13)

Low - rapid decomposition

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

$1 mg/m^3$ TLV (NIOSH)

RAT LC_{50}

389 mg/Kg Oral LD50 (NIOSH)

ORDOR THRESHOLD

Preceptable sulfide @ 0.77 ppm (2)

TASTE THRESHOLD

DISCUSSION

DWHI = 7.3×10^{-5}
VHI = 31.6

CHEMICAL NAME

Phthalic Anhydride

SYNONYM/OTHER NAMES

Benzene Dicarboxylic Acid Anhydride

MOLECULAR WEIGHT

148.12

SOLUBILITY ·

Sparingly soluble in H_2O, .7 parts per 100 in H_2O (S-4) 6200 ppm (G-7)

DENSITY

1.49 (Sp. Gr.) (S-7)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

2×10^{-4} torr @ 20°C (G-13)
1 mm Hg @ 96.5°C (2)

VAPOR DENSITY

6.59 g/l (2)

EVAPORATION RATE

Volatilization Constant = 5×10^{-4} (G-13)

ENVIRONMENTAL PERSISTENCE

Bacterial Degradation Rate = 5×10^{-4} hr^{-1} (G-13). .7-1.2 lb/lb BOD_5 with sewage sludge seed. Biodegrades at moderate to fast rate. Half-life in river water is 1.5 weeks.(2)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 0.24 (G-7)

BIOACCUMULATION POTENTIAL

None (2) BCF = 0 (G-7)

INHALATION

TLV = 2 ppm (S-12)

RAT LD_{50}

800 mg/Kg (2)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

Some data from files on Phthalic Anhydride.
DWHI = .221
VHI = 2.63×10^{-2}

CHEMICAL NAME

Mixture of Ammoniates of [Ethylene-Bix-(Dithiocarbamate] Zinc with Ethylenebis [Dithiocarbamic Acid], Bimolecular and Trimolecular Cyclic Anhydrosulfides and Disulfides (Polyram)

SYNONYM/OTHER NAMES

FMC 9102, Metiram

MOLECULAR WEIGHT

SOLUBILITY

Insoluble (M-4)

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Major route of transport unknown. (M-7)

Hydrolysis Constant = $>4 \times 10^{-3}$ hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

>10,000 mg/Kg Oral (M-4)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 2.86×10^{-6}

CHEMICAL NAME

Propionic Acid

SYNONYM/OTHER NAMES

Propanoic Acid, Methylacetic Acid, Ethyl Formic Acid

MOLECULAR WEIGHT

74.08 (3)

SOLUBILITY

1,000,000 ppm @ 25°C (2)

DENSITY

.993 (Sp. Gr.) (2)

WATER CHEMISTRY

Will be dissolved in water (2)

SOIL ATTENUATION

Adsorption proportional to organic content of soils and surface area of clays.(2)

VOLATILITY

10 mm Hg @ 39.7°C (3)

VAPOR DENSITY

2.56 (3)
BOD_5 = 37% ThOD

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Bacterial Degradation Constant = 3×10^{-2} hr^{-1} (G-13) 40% theoretical BOD. .36-1.3 lbs oxygen can be utilized in first 5 days.(2)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 1 (G-13) ThOD = 1.51 (S-12)

BIOACCUMULATION POTENTIAL

Biodegrades quickly (2)

INHALATION

TLV 10 ppm (3)

RAT LD_{50}

4290 mg/Kg Oral (2)

ODOR THRESHOLD

.034 ppm; .020 ppm (E-1)

TASTE THRESHOLD

DISCUSSION

DWHI = 6.66
VHI =263

CHEMICAL NAME

Propylamine

SYNONYM/OTHER NAMES

1-Aminopropane

MOLECULAR WEIGHT

59.1 (E-1)

SOLUBILITY

1,000,000 ppm @ 25°C; miscible in water → alkaline solution (2)

DENSITY

.719 (Sp. Gr.) (2)

WATER CHEMISTRY

Dissolves into water, due to dissociation of amine group.(2)

SOIL ATTENUATION

Adsorption proportional to organic content of soils and surface area of clays. Undergoes good cation exchange with clays in acid or neutral environment.(2)

VOLATILITY

200 mm Hg @ 15°C (2)

VAPOR DENSITY

2.585 g/l (2)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Bacterial Degradation Constant = 1 x 10^{-3} hr^{-1} (G-13)
Butylamine used 26.5% of its theoretical oxygen demand in the first 5 days. Properties may be similar for propyleamine.(2)

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = 0.25 (G-14)

BIOACCUMULATION POTENTIAL

Biodegrades at a moderate rate (2)

INHALATION

TLV = 2.1 ppm (S-12)

RAT LD_{50}

570 mg/Kg Oral (2[R-119])

ODOR THRESHOLD

2.1 ppm (E-1)

TASTE THRESHOLD

DISCUSSION

DWHI = 50.1
VHI = 2.50 x 10^4 (TLV)

CHEMICAL NAME

Propyl Mercaptan

SYNONYM/OTHER NAMES

1-Propanethiol, 3-Mercaptopropanol

MOLECULAR WEIGHT

76.15 (E-2)

SOLUBILITY

Very slightly soluble (S-6) 20 mg/l

DENSITY

.8408 @ 20°C (Sp. Gr.) (S-7)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

200 mm Hg @ 31.5°C (S-6)

VAPOR DENSITY

EVAPORATION RATE

Volatilization Constant = .02 hr^{-1} (G-13)

ENVIRONMENTAL PERSISTENCE

Bacterial Degradation Constant = 0.02 hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 14 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

7300 ppm 4 hours LC_{50} (NIOSH)

RAT LD_{50}

1790 mg/Kg Oral (NIOSH)

ODOR THRESHOLD

.000075 mg/l (S-12)

TASTE THRESHOLD

DISCUSSION

DWHI = 1.6×10^{-4}
VHI = 7.2

CHEMICAL NAME

Pyridine

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

79.10 (E-1)

SOLUBILITY

>1,000,000 ppm @ 25°C (2) Miscible

DENSITY

.983 (Sp. Gr.) (2)

WATER CHEMISTRY

Readily dissolved into water column(2)

SOIL ATTENUATION

Sorbs in 17 minutes on clays. Desorption a maximum at pH = 5. At pH >7, desorption drops off rapidly.(S-4)

VOLATILITY

20 mm Hg @ 25°C (3)

VAPOR DENSITY

2.73 (3)

EVAPORATION RATE

Low due to highly soluble nature of compound.(3)

ENVIRONMENTAL PERSISTENCE

Bacterial Degradation Rate = 3 x 10^{-2} hr^{-1} (G-13) 100% reduction, three day river water, BOD. 1.15-1.47 lb/lb 5 day BOD with sewage sludge.

OCTANOL/WATER PARTITION COEFFICIENT

Kow = $10^{.66}$ (G-13)

BIOACCUMULATION POTENTIAL

Biodegrades moderately quickly. 1 mg/l concentration drops to 0 mg/l in 7-8 days with a sudden 60-70% drop on the last day.(2)

INHALATION

TLV = 5 ppm

RAT LD_{50}

1580 mg/Kg (2[APD])

ODOR THRESHOLD

.230 ppm (E-1)

TASTE THRESHOLD

DISCUSSION

DWHI = 18.1
VHI = 1050 (TLV)

198

~~175~~

CHEMICAL NAME

Sodium Fluoride

SYNONYM/OTHER NAMES

Villiaumite

MOLECULAR WEIGHT

41.99 (3)

SOLUBILITY

43,000 mg/l @ 25°C; insoluble in alcohol (2)

DENSITY

2.78 (Sp. Gr.) (2)

WATER CHEMISTRY

Will be dissolved in water (2)

SOIL ATTENUATION

Sodium undergoes cation exchange with clays. Fluorides precipitate out in soils of high calcium content. Soil can bind fluorides tightly if pH is >6.5. High calcium content will also immobilize fluorides.(2)

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Natural calcium will reduce fluoride levels.(2)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

TLV - 2.5 mg/m^3 (2)

RAT LD_{50}

LD_{50} Hamster - 70-80 mg/Kg Oral (2)

ODOR THRESHOLD

TASTE THRESHOLD

2.4 ppm (2)

DISCUSSION

DWHI = 17.6
VHI = 2.5

CHEMICAL NAME

Succinonitrile

SYNONYM/OTHER NAMES

Ethylene Cyanide, Ethylene Dicyanide, Butanedinitrile, Succinic Acid Dinitrile, Sym-Dicyanoethane, Dinile, Deprelin, Suxil

MOLECULAR WEIGHT

80.09

SOLUBILITY

Soluble in alcohol, water, and chloroform.(A-7) 1.3 x 10^5 mg/l (G-13)

DENSITY

1.022 @ 25°C (A-8)

WATER CHEMISTRY

Slightly soluble in water.(A-7)

SOIL ATTENUATION

VOLATILITY

2 mm @ 100°C (A-8)

VAPOR DENSITY

2.1 (A-8)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Bacterial Degradation Rate = 4 x 10^{-3} hr^{-1} (G-13)
Highly toxic, like nitriles.

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = $10^{-.5}$ (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

100 mg/Kg (ipr Mouse, LD_{LO}) (NIOSH)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 286
VHI = N/A

142

CHEMICAL NAME

Chloroethyl, Ethylsulfide

SYNONYM/OTHER NAMES

1-chloro-2-(ethylthio) ethane, Sulfide, Chloroethyl Ethyl

MOLECULAR WEIGHT

124.64 , 124.5

SOLUBILITY -- →10,000

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE -- Hydrolysis Rate Constant = 0.72
= 0.72 day^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 20 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

252 mg/Kg LD50, oral (NIOSH)

ORDOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 1.13

CHEMICAL NAME

2,4,5-Trichlorophenoxyacetic Acid (2,4,5-T)

SYNONYM/OTHER NAMES

Weedone, Esteron, Reddox, Trinoxol

MOLECULAR WEIGHT

256 (M-4)

SOLUBILITY

278 ppm @ 25°C (M-4)

DENSITY

1.80 20/20 (M-10); 1.662 (2)

WATER CHEMISTRY

SOIL ATTENUATION

Kd ~2.0 (M-8) Koc = 42 (G-2)

VOLATILITY

Low (M-4) <.01 torr @ 20°C (G-13)

VAPOR DENSITY

EVAPORATION RATE -- Volatilization Constant = 1×10^{-3} hr^{-1} (G-13)

ENVIRONMENTAL PERSISTENCE

Photolysis and Volatilization Rate = 1×10^{-3} hr^{-1} (G-13) Transported mainly in the water. (M-7) Applied to soil at 5 ppm -- persisted 166 to >190 days. 1/2 to 3 lb/A on moist loam soil - 2-5 weeks -- little or no leaching. Generally persists about 3 months under moist soil conditions. (M-5) No buildup in soil from annual usage. (M-10)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 4 (G-7)

BIOACCUMULATION POTENTIAL

Factor is 0 (M-9) BCF = 25 (G-7)

INHALATION

10 mg/m^3 (2)

RAT LD_{50}

300 mg/Kg Oral (M-4)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = .026
VHI = .316

CHEMICAL NAME

Dioxin (TCDD), 2,3,7,8 Tetrachlorodibenzo-P-Dioxin (Also includes Hexachlorodibenzo-p-Dioxin and Octachlorodibenzo-p-Dioxin)

SYNONYM/OTHER NAMES

2,6-Dimethyl-m-Dioxan-4-yl acetate

MOLECULAR WEIGHT

TCDD - 321.98; OCDD - 459.72; Hexa form - 390.84

SOLUBILITY

Slightly soluble, .2-.6 μg/l (1)

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

Several independent studies indicate that TCDD does not exhibit much vertical or horizontal mobility in soil. No leaching was observed from any of the soils studied, including sand, Norfolk sandy loam, Lakeland sandy loam, Hager Stown silty clay loam, Barnes clay loam, and Celeryville muck. Half-life in soil of approximately 1 year.(S-5)

VOLATILITY

Relatively involatile (1)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

It has been shown to persist 10 years after application to soils and to bioaccumulate in aquatic organisms.

Studies have concluded that TCDD is highly resistant to microbial degradation. It is thought the primary route for degradation is photolysis. It can be removed by extraction with coconut charcoal.(S-5) (1) Overall disappearance $<8 \times 10^{-5}$ hr^{-1}.(G-13)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = $10^{.24}$ (G-13)
Partition coefficient of TCDD in a water/hexane system was reported as 1000.(1)

BIOACCUMULATION POTENTIAL

5,800 (from fish) (1)

INHALATION

RAT LD_{50}

Mouse - 112 μg/Kg (NIOSH); Rats - 22-45 μg/Kg (TCDD); 750 μg/Kg for hexachloro form mixed with PCDD and HCDD (NOISH)

MAC = 4.55×10^{-7} μg/l (307)

ODOR THRESHOLD TASTE THRESHOLD

DISCUSSION

Similar properties for Hexachlorodibenzo-p-Dioxin and Octachlorodibenzo-p-Dioxin

DWHI = 3.6×10^{-4}
VHI = N/A
CWHI = 4×10^{5}

CHEMICAL NAME

Tetraethyl Pyrophosphate (TEPP)

SYNONYM/OTHER NAMES

Nifos T, Vapotone, Bladan, Tetron

MOLECULAR WEIGHT

290.2 (M-4)

SOLUBILITY

Miscible (M-4)

DENSITY

1.200 (2)

WATER CHEMISTRY

Chemical hydrolysis. Hydroscopic mobile liquid. Quickly hydrolizes (half-life at 25° about 7 hours in 50 V/V mix).(2)

SOIL ATTENUATION

Kd ∿50 (M-8)

VOLATILITY -- 1.5 x 10^{-4} torr @ 20°C (G-13)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Hydrolysis Constant = 0.1 hr^{-1} (G-13)
Persistence reported 1-2 days (assume water).(2) Transported mainly in the water.(M-7)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

Low potential (2)

INHALATION

0.05 mg/m^3 (2)

RAT LD_{50}

1.2-2.0 mg/Kg Oral (M-4)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 2381

CHEMICAL NAME

1,2,4,5 Tetrachlorobenzene

SYNONYM/OTHER NAMES

Benzene Tetrachloride

MOLECULAR WEIGHT

215.9

SOLUBILITY

6 ppm (G-7)

DENSITY

1.734 (A-8); 1.858 @ 21/4°C (Sp. Gr.) (A-11)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

<0.1 mm @ 25°C (A-8)

VAPOR DENSITY

7.4 (A-8)

EVAPORATION RATE -- Volatilization Constant = 4×10^{-3} hr^{-1} (G-13)

ENVIRONMENTAL PERSISTENCE

Degradation by Pseudomonas: 200 mg/l @ 30°C.(A-11)

OCTANOL/WATER PARTITION COEFFICIENT

Kow - 47,000 (G-7)

BIOACCUMULATION POTENTIAL

BCF - 4500 (flowing) (G-7) Low toxicity

INHALATION

RAT LD_{50} -- MAC = 17 ug/l (307)
1500 mg/Kg (Oral Rat) (NIOSH)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

CWHI = 3.5×10^{2}
DWHI = 1.1×10^{-4}

CHEMICAL NAME

1,1,2,2-Tetrachloroethane, 1,1,1,2-Tetrachloroethane

SYNONYM/OTHER NAMES

Acetylene Tetrachloroethane

MOLECULAR WEIGHT

167.9 (E-1)

SOLUBILITY

2.9 gm/l H_2O (1) 2600 (G-13)
4500 ppm 1,1,2,2 (G-8)

DENSITY

1.593 @ 25°C (Sp. Gr.)
13.25 lb/gal (S-5)

WATER CHEMISTRY

Known to form azeotropes with water (1)

SOIL ATTENUATION

VOLATILITY

5.0 mm Hg @ 20.1°C (S-6)

VAPOR DENSITY

5.79 (Air = 1) (E-3)

EVAPORATION RATE -- Volatilization half-life 21 min.(G-8) Volatilization Constant = 0.01 hr^{-1} (G-13)

ENVIRONMENTAL PERSISTENCE

pH 7, T = 15°C, half-life of 2 years. pH 7.7, T = 15°C, half-life of 26 days.(1)

OCTANOL/WATER PARTITION COEFFICIENT

"High value" - ~398 (1) (S-9)

BIOACCUMULATION POTENTIAL

Bioconcentration value of 8 was reported for blue gill.(1)

INHALATION -- TLV = 5 ppm

RAT LD_{50} -- MAC = 1.8 μg/l (307)
320 mg/Kg (G-9)

ODOR THRESHOLD

5.00 ppm (in water) (E-1)

TASTE THRESHOLD

DISCUSSION

DWHI = .40
VHI =263 (TLV)
CWHI = 2.5 x 10^6

CHEMICAL NAME

Tetrachloronitrobenzene

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

260.88

SOLUBILITY -- →10 mg/l

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE -- Volatilization Constant = .01 hr^{-1} (G-13)

ENVIRONMENTAL PERSISTENCE

OCTANOL/WATER PARTITION COEFFICIENT -- – Kow = 50,000

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

1,2,4,5-3 250mg/Kg (isomer)
oral mammal (NIOSH)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 1.1×10^{-3}

CHEMICAL NAME

2,3,4,6 Tetrachlorophenol

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT -- 142

SOLUBILITY

0.10 g/100g water @ 25°C (A-5)

DENSITY

1.839 @ 25/4°C (Sp.Gr.) (A-7)

WATER CHEMISTRY

Ka = 4.2×10^{-6} @ 25°C (A-5)

SOIL ATTENUATION

VOLATILITY

1mm Hg @ 100°C (A-5)

VAPOR DENSITY

EVAPORATION RATE -- Volatilization Constant = 5×10^{-3} hr^{-1} (G-13)

ENVIRONMENTAL PERSISTENCE -- Oxidation Constant = 5×10^{-3} hr^{-1} (G-13)

relatively persistent with soil inoculum, takes >72 days to completely degrade. photolysis of UV radiation (A-5)

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = 4.1 (G-14)

BIOACCUMULATION POTENTIAL

Not specified, but indications are that there is some accumulation potential in fatty tissue. (A-5)

INHALATION

RAT LD_{50}

140 mg/Kg (S-12)
MAC = 263 μg/l (Taste, 307)

ORDOR THRESHOLD

915-47000 μg/l (2)

TASTE THRESHOLD

0.263 ppm (A-4)

DISCUSSION

DWHI = 0.204
VHI = N/A
CWHI = 3.8×10^3

CHEMICAL NAME

Tetrahydrofuran

SYNONYM/OTHER NAMES

Diethylene Oxide, Tetramethylene Oxide, THF

MOLECULAR WEIGHT

72.1

SOLUBILITY

Miscible (3)

DENSITY

55.4 lb/ft^3 @ 20°C (3)

WATER CHEMISTRY

No reaction with water (3)

SOIL ATTENUATION

VOLATILITY

2.3 psia @ 20°C (3) 176 torr (G-13)

VAPOR DENSITY

0.031 lb/ft^3 @ 20°C (3)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE -- Volatilization Degradation Rate = 3×10^{-3} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = $10^{.46}$ (G-14)

BIOACCUMULATION POTENTIAL

None (3)

INHALATION

TLV - 200 ppm (3)

RAT LD_{50}

50 mg/Kg Oral Human LD_{LO} (NIOSH)

ODOR THRESHOLD

20-50 ppm (3)

TASTE THRESHOLD

DISCUSSION

DWHI = 57.1
VHI = 231

CHEMICAL NAME

Toluene

SYNONYM/OTHER NAMES

Toluol, Methyl-Benzene, Phenylmethane, Methacide

MOLECULAR WEIGHT

92.1 (E-1)

SOLUBILITY

470 ppm @ 25°C (2)

DENSITY

.866 g/cm^3 @ 20°C (2)

WATER CHEMISTRY

Floats on surface of water, will dissolve very slowly. 534.8 ± 4.9 mg/l in freshwater, 379.3 ± 2.8 mg/l in seawater.(1,2)

SOIL ATTENUATION

99.3% goes to atmosphere, not readily found in soils.(1)

VOLATILITY

28.4 mm Hg @ 25°C (1)

VAPOR DENSITY

3.14 (2)

EVAPORATION RATE

70% evaporates with first .01% of water (R-27) (2)

ENVIRONMENTAL PERSISTENCE

Biodegrades with acclimated seed. Half-life is 30.6 minutes, mainly due to evaporation. Sewage seed has no effect.(2)

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = 2.07 (G-14)

BIOACCUMULATION POTENTIAL

Negligible, material does not bioconcentrate.(1)

INHALATION

TLV = 200 ppm (S-12)

RAT LD_{50}

7530 mg/Kg (2[R-19])
MAC = 12.4 mg/l (307)

ODOR THRESHOLD

214 ppm (E-1)

TASTE THRESHOLD

DISCUSSION

DWHI = .002
VHI =37.4 (TLV)
CWHI = 38

CHEMICAL NAME

Toxaphene or Chlorinated Camphene with 67-69% Chlorine (Toxaphene)

SYNONYM/OTHER NAMES

Camphechlor, Hercules 3956, Altox, Estonox, Chem-Phene, Geniphene, Gy-phene, Phenacide, Phenatox, Toxadust, Toxaspra

MOLECULAR WEIGHT

413 (M-4)

SOLUBILITY

3 ppm @ 25°C (M-4)

DENSITY

1.660 (2)

WATER CHEMISTRY

SOIL ATTENUATION

Kd ∿5 x 10^4 (M-8)

VOLATILITY

1 x 10^{-6} mm Hg (G-2)
v.p. 0.2-0.4 mm Hg @ 25°C (M-4)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Persistent in sediments for long periods of time. Relatively stable but may dehydrochlorinate upon prolonged exposure to sunlight, alkali, or high temperatures (above 120°C).(1) Lakes toxic for 3-4 years after toxaphene treatment.(2) Applied to soil at 50 ppm (50% loss) about 11 years. Sandy loam at 100 ppm - 45% after 14 years.(M-5) Transport primarily in sediments.(M-7) Losses from soil may be by microbial decomposition, photodecomposition, and/or volatilization.(Z-1) Half-life in sandy clay soil is 4 years.(Z-1) Soil half-life is 11 years.(G-4)

OCTANOL/WATER PARTITION COEFFICIENT

825 (1)

BIOACCUMULATION POTENTIAL

Oysters, 3920x; aquatic invertebrates, 1500x; rainbow trout, 15,000x
BCG = 491 (G-7)

INHALATION

0.5 mg/m^3 (2)

RAT LD_{50}

69 mg/Kg Oral (M-4)
MAC = 0.47 ng/l (307)

ODOR THRESHOLD

0.0052 ppm (D-1)

TASTE THRESHOLD

DISCUSSION

DWHI = .001; CWHI = 6.4 x 10^6; VHI = .001

CHEMICAL NAME

Trichlorobenzene

SYNONYM/OTHER NAMES

1,2,4 Trichlorobenzene, Unsym. Trichlorobenzene

MOLECULAR WEIGHT

181.46

SOLUBILITY

Insoluble in water (2) 30 ppm (G-7)

DENSITY

1.4542 @ 20/4°C (Sp. Gr.) 1.690 (2)

WATER CHEMISTRY

Insoluble (2)

SOIL ATTENUATION

Adsorption proportional to organic content of soils and surface area of clays.

VOLATILITY

1 mm Hg @ 38.4°C (S-12) 10 mm Hg @ 78°C (2)

VAPOR DENSITY

6.26 (2)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Does not biodegrade well.(2)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 15,000 (G-7)

BIOACCUMULATION POTENTIAL

May accumulate similar to chlorinated pesticides.(2) BCF = 491 (G-7)

INHALATION

TLV = 25 ppm

RAT LD$_{50}$

MAC = 13 μg/l (Taste, 307)
756 mg/Kg Oral (LC$_{50}$) (2)

ODOR THRESHOLD

TASTE THRESHOLD

1,2,3 .013 ppm (A-4)

DISCUSSION

DWHI = .001
VHI = 5.26 (TLV)
CWHI = 2.3 x 10^{3}

CHEMICAL NAME

1,1,1 Trichloroethane

SYNONYM/OTHER NAMES

Methyl Chloroform

MOLECULAR WEIGHT

133.41

SOLUBILITY

4.4×10^3 mg/l @ 20-25°C (S-9)
950 ppm (G-8)

DENSITY

1.332 (A-6)

WATER CHEMISTRY

Reacts slowly, releasing hydrochloric acid. Non-ionic.(3)

SOIL ATTENUATION

Adsorption proportional to organic content of soils and surface area of clays.(2)

VOLATILITY

100 mm @ 20°C (S-12)
144 mm Hg @30°C (A-6)

VAPOR DENSITY

4.55 (A-6)

EVAPORATION RATE

Half-life in water = 22 minutes.(2)

ENVIRONMENTAL PERSISTENCE

Has low BOD. Can be aerated out of solution. Decomposes in water or steam. At elevated temperatures without stabilizing agents, it decomposes in the atmosphere. Stable to sunlight at low altitudes but reactive at high altitudes. Hydrolysis half-life in light or dark is 6 months. In seawater after 200 hours, linear losses were 60% in light-open systems, 30% in light-closed, 20% in dark-closed, and 40% in dark-open. Volatility more important than photodegradation. Half-life in seawater is 39 weeks @ pH 8 @ 10°C.(2)

OCTANOL/WATER PARTITION COEFFICIENT

158.5 (S-9) Log Kow = 2.2 (G-10)

BIOACCUMULATION POTENTIAL

May act similar to chlorinated pesticides. Bioaccumulation factor = 13.(2)

INHALATION

TLV = 350 ppm (S-12)

RAT LD_{50}

10,300 mg/Kg (S-12)
MAC = 15.7 mg/l (307)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

$DWHI = 2.64 \times 10^{-3}$
$VHI = 75.1$ (TLV)
$CHWI = 2.8 \times 10^{2}$

CHEMICAL NAME

1,1,2 Trichloroethane CH_3CCl_3

SYNONYM/OTHER NAMES

Methylchloroform, Chlorothene, Vinyl Trichloride, β Trichloroethane

MOLECULAR WEIGHT

133.4

SOLUBILITY ·

Slightly soluble in water (2)
→ 200 mg/l

DENSITY

1.4405 (Sp. Gr.) (1)
1.4416 @ 20/4°C (A-8)

WATER CHEMISTRY

Slightly soluble (2)

SOIL ATTENUATION

Adsorption proportional to organic content of soils and surface area of clays.(2)

VOLATILITY

19 mm @ 20°C (S-12)
40 mm Hg @ 35.2°C (A-8)

VAPOR DENSITY

EVAPORATION RATE

Half-life in water due to evaporation 22 minutes.(2)

ENVIRONMENTAL PERSISTENCE

Decomposes in presence of water or steam. At elevated temperatures (w/o stabilizing agents) it is oxidized by the atmosphere. Stable to sunlight at low altitudes, but reactive at high altitudes. Hydrolysis half-life is 6 months in light or dark. In seawater after 200 hours, linear losses were 60% in light-open systems, 30% in light closed, 20% in dark-closed, and 40% in dark-open. Volatility more important than photodegradation.(2)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 158.5 (G-13)

BIOACCUMULATION POTENTIAL

Weighted average bioaccumulation factor 6.3 excretion relatively rapid intraperitoneal injection is 90%, ejected after 24 hours.(1) Bioaccumulation factor = 13.(2)

INHALATION

TLV - 10 ppm (S-12)

RAT LD_{50}

100 mg/Kg (S-12)
MAC = 2.7 μg/l (307)

ODOR THRESHOLD

400 ppm (2)

TASTE THRESHOLD

DISCUSSION

DWHI = 6.0×10^{-2}
VHI = 500 (TLV)
CWHI = 7.4×10^{4}

CHEMICAL NAME

2,4,5 Trichlorophenol $C_6H_3Cl_3O$

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

197.46

SOLUBILITY

.2 g/100 g (A-9) 200 mg/l

DENSITY

1.678 @ 25/4°C (Sp. Gr.) (A-7)

WATER CHEMISTRY

Sinks as a solid. Dissolves slowly. Soluble to a small extent, Ka 3.7×10^{-8} (A-5)

SOIL ATTENUATION

Adsorption proportional to organic content of soils and surface area of clays.(2)

VOLATILITY

$\sim$.1 torr @ 20°C (G-13)
1 mm Hg @ 72°C (2)

VAPOR DENSITY

EVAPORATION RATE

Volatilization Constant = 5×10^{-3} hr^{-1} (G-13)

ENVIRONMENTAL PERSISTENCE

Oxidation and Degradation Rate = 5×10^{-3} hr^{-1} (G-13)
Relatively persistent, takes >72 days to degrade completely with soil innoculum photolysis from UV radiation.(2)

OCTANOL/WATER PARTITION COEFFICIENT

Low Kow = 3.72 (G-14)

BIOACCUMULATION POTENTIAL

Can accumulate in lipid fraction(2)

INHALATION

RAT LD_{50}

820 mg/Kg Oral, Intraperitonial -
276 mg/Kg; MAC = 10 μg/l (Taste, 307)

ODOR THRESHOLD

11-1000 mg/Kg (2)

TASTE THRESHOLD

DISCUSSION

DWHI = .07; VHI = N/A; CWHI = 2×10^5

CHEMICAL NAME

2,4,6 Trichlorphenol $C_6H_3Cl_3O$

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

197.46

SOLUBILITY

800 ppm @ 25°C (2)

DENSITY

1.675 @ 25/4°C (Sp. Gr.) (A-7)

WATER CHEMISTRY

Sinks as a solid. Soluble to a small extent Ka 3.8×10^{-8} (A-5)

SOIL ATTENUATION

Adsorption proportional to organic content of soils and surface area of clays.(2)

VOLATILITY

1 mm Hg @ 76.5°C (2)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Takes 5-13 days to degrade completely with soil innoculum. Photolysis as a result of UV radiation.(2)

OCTANOL/WATER PARTITION COEFFICIENT

Log Kow = 3.62 (G-14)

BIOACCUMULATION POTENTIAL

Can bioaccumulate in lipid fraction (2)

INHALATION

RAT LD_{50}

820-2960 mg/Kg (3)

ODOR THRESHOLD

11-1000 mg/l (2)

TASTE THRESHOLD

DISCUSSION

DWHI = .028
VHI = N/A

CHEMICAL NAME

1,2,3 Trichloropropane

SYNONYM/OTHER NAMES

Glycerol Trichlorohydrin, Allyl Trichloride Trichlorohydrin

MOLECULAR WEIGHT

147.44 (S-7)

SOLUBILITY.

Slightly soluble in water (S-5)
<1000 mg/l (G-13)

DENSITY

1.39 @ 20°C (Sp. Gr.) (S-5)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

10 mm Hg @ 46°C (S-7)
2 mm Hg @ 20°C (S-12)

VAPOR DENSITY

5.0 (S-7)

EVAPORATION RATE -- Volatilization Constant = 0.02 hr^{-1} (G-13)

ENVIRONMENTAL PERSISTENCE

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

Cummulative toxicity, a lipoid solvent.(S-7) Factor is 9 from Trichloroethane data.(S-9)

INHALATION -- TLV = 5 ppm (S-12)

RAT LD_{50} -- 320 mg/Kg (G-9)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = .009
VHI = 10.5 (TLV)

CHEMICAL NAME

α,α,α-Trifluoro-2,6-Dinitro-N,N-Dipropyl-p-Toluidine (Trifluralin)

SYNONYM/OTHER NAMES

L-36, 352, Treflan

MOLECULAR WEIGHT

335.3 (M-4)

SOLUBILITY.

24 ppm @ 27°C (M-4)
0.58 ppm (G-2)

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

Kd ∿500 (M-8) Strongly adsorbed on soils -- negligible leaching.(M-10) Microbes believed significant cause of trifluralin disappearance.
Koc = 13,700 (G-7)

VOLATILITY

v.p. 1.97 x 10^{-4} mm Hg @ 30°C (M-4)

VAPOR DENSITY

EVAPORATION RATE-- Volatilization Constant = 3 x 11^{-5} hr^{-1} (G-13)

ENVIRONMENTAL PERSISTENCE Photolysis and Volatilization Degradation Rate = <3 x 10^{-5} hr^{-1} (G-1e)

Soil persistence -- about 6 months.(M-5) Soil persistence for 120-180 days. Transported with the sediments.(M-7) Susceptible to UV decomposition. Slightly volatile.(M-10)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 220,000 (G-7)

BIOACCUMULATION POTENTIAL -- BCF = 926-4570 (G-7)

INHALATION

RAT LD_{50}

>10,000 mg/Kg (M-4)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 1.66 x 10^{-6}
VHI = N/A

CHEMICAL NAME

O,O,S-Trimethyl Phosphorodithioate

SYNONYM/OTHER NAMES

Phosphorodithioic Acid, Trimethyl Esters

MOLECULAR WEIGHT -- 172

SOLUBILITY -- → 1000 mg/l

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE -- Hydrolysis Constant = 8×10^{-4} hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT

Log Kow = 0.07 (G-14)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = N/A
VHI = N/A

CHEMICAL NAME

Trimethyl Phosphate

SYNONYM/OTHER NAMES

Methyl Phosphate, Phosphoric acid methyl ester

MOLECULAR WEIGHT

140.09

SOLUBILITY

Soluble in water, gasoline (S-5)
→ 1000 mg/l

DENSITY

1.21 mg/l @ 68°F (S-5)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY -- 1 torr @ 26°C (G-13)

VAPOR DENSITY

EVAPORATION RATE -- Volatilization Constant = 1.5×10^{-4} hr^{-1} (G-13)

ENVIRONMENTAL PERSISTENCE -- Hydrolysis Degradation Rate = 1.5×10^{-4} hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = $10^{-.52}$ (G-14)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

840 mg/Kg, oral LD50 (NIOSH)

ORDOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 0.007
VHI = N/A

CHEMICAL NAME

0,0,0 Trimethyl Phosphorothioate

SYNONYM/OTHER NAMES

Phosphorothioic Acid Trimethyl Ester

MOLECULAR WEIGHT

156.15

SOLUBILITY

→ 1000

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Hydrolysis Constant = 1.92×10^{-3} day^{-1} (G-13) Related to methyl parathion and parathion whose properties are as follows: methyl parathion: 90% disappears in water solution after 4.4 days. parathion: t 1/2 in soils is 32 days (very pH dependent).(G-2)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

220 ppm over 4 hrs LC_{LO} (NIOSH)

RAT LD_{50}

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = N/A
VHI = N/A

CHEMICAL NAME

1,3,5 Trinitrobenzene

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

213.11 (E-2)

SOLUBILITY

Insoluble in water, soluble in alcohol, ethers (S-5) 350 mg/l (G-13)

DENSITY

1.688 @ 20°C (Sp. Gr.) (S-5)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE -- Volatilization Degradation Rate = $<3 \times 10^{-4}$ hr^{-1} (G-13)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = $10^{1.37}$ (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

505 mg/Kg Oral (NIOSH)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = .02
VHI = N/A

CHEMICAL NAME

S-Propyldipropylthiocarbamate (Vernolate)

SYNONYM/OTHER NAMES

R-1607, Vernam®, PPTC

MOLECULAR WEIGHT

203.1 (M-4)

SOLUBILITY

90 ppm @ 20°C (M-4)

DENSITY

0.954 20/20 (M-10)

WATER CHEMISTRY

SOIL ATTENUATION

Kd ~100 (M-8)

VOLATILITY

v.p. 10.4×10^{-3} mm @ 25°C (M-4)

VAPOR DENSITY

EVAPORATION RATE -- Volatilization Constant = 2×10^{-2} hr^{-1} (G-13)

ENVIRONMENTAL PERSISTENCE

Bacterial Degradation Constant = 2×10^{-3} hr^{-1} (G-13)
Adsorbed onto dry soil -- can be removed by leaching. Microbial degradation -- main mechanism of soil loss. Readily lost by volatilization if soil is wet and not incorporated. Half-life in moist loam soil at 70-80°F is about 1 1/2 weeks.(M-10) Transported in water and sediment.(M-7) Soil half-life 19-57 days.(G-2

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

1780 mg/Kg Oral (Male) (M-4)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = .001
VHI = N/A

CHEMICAL NAME

M-Xylene

SYNONYM/OTHER NAMES

1-3 Dimethyl Benzene

MOLECULAR WEIGHT

106.2

SOLUBILITY .	DENSITY
Insoluble (2) 130 mg/l (G-13)	.8684 @ 15°C (Sp. Gr.) (2)

WATER CHEMISTRY

Will form slick on the surface of water (2)

SOIL ATTENUATION

VOLATILITY	VAPOR DENSITY
10 mm Hg @ 28.3°C (2)	3.66 (2)

EVAPORATION RATE -- Volatilization Rate = 3×10^{-2} hr^{-1} (G-13)

ENVIRONMENTAL PERSISTENCE -- Bacterial Degradation Rate = 2×10^{-3} hr^{-1} (G-13)

0% theoretical BOD_8 with treatment plant seed. 0% (lb/lb) BOD_5 with sewage sludge seed. Does not biodegrade well.(2)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = $10^{3.26}$ (G-14)

BIOACCUMULATION POTENTIAL

Data not available (3)

INHALATION	RAT LD_{50}
	Oral - 6690 mg/Kg (2)

ODOR THRESHOLD	TASTE THRESHOLD
.26-4.13 ppm (2)	.3 ppm (2)

DISCUSSION

DWHI = .001
VHI = N/A

CHEMICAL NAME

P-Xylene

SYNONYM/OTHER NAMES

1,4 Dimethyl Benzene

MOLECULAR WEIGHT

106.2

SOLUBILITY

Insoluble (2) 198 mg/l (G-13)

DENSITY

.86 @ 25°C (Sp. Gr.) (2)

WATER CHEMISTRY

Slick will float on the surface of water (2)

SOIL ATTENUATION

VOLATILITY

10 mm Hg @ 27.3°C (2)

VAPOR DENSITY

3.66 (2)

EVAPORATION RATE -- Volatilization Rate = 3×10^{-2} hr^{-1} (G-13)

ENVIRONMENTAL PERSISTENCE -- Bacterial Degradation Rage = 2×10^{-3} hr^{-1} (G-13)

35.8% theoretical BOD_8 with treatment plant seed. 0% lb/lb BOD_5 with sewage sludge seed.

Biodegrades slowly with acclimated seed.(2)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = $10^{3.15}$ (G-14)

BIOACCUMULATION POTENTIAL

Data not available (3)

INHALATION

RAT LD_{50}

4000-4300 mg/Kg (2)

ODOR THRESHOLD

.26-4.13 ppm (2)

TASTE THRESHOLD

.3 ppm (2)

DISCUSSION

DWHI = .001
VHI = N/A

CHEMICAL NAME

Zinc ethylenebisdithiocarbamate (Zineb)

SYNONYM/OTHER NAMES

Dithane Z-78®, Parzate Zineb®

MOLECULAR WEIGHT

275.7 (M-4)

SOLUBILITY

10 ppm @ 25°C (M-4)

DENSITY

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

v.p. negligible (M-4)

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Hydrolysis Degradation Rate = >4 x 10^{-3} hr^{-1} (G-13)
Applied to soil -- persisted >35 days.(M-5) Transported mainly in sediment.(M-7)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 60 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

RAT LD_{50}

>5200 mg/Kg Oral (M-4)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 5.5 x 10^{-5}
VHI = N/A

CHEMICAL NAME

O-Xylene

SYNONYM/OTHER NAMES

1,2 Dimethylbenzene

MOLECULAR WEIGHT

106.2 (S-7)

SOLUBILITY

175 ppm @ 25°C (2)

DENSITY

.88 @ 25°C (Sp. Gr.) (2)

WATER CHEMISTRY

Forms slick on the surface of water (2)

SOIL ATTENUATION

VOLATILITY

5.0 mm Hg @ 20°C (S-12); 6.6 mm Hg @ 25°C(2)

VAPOR DENSITY

3.66 (2)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Bacterial Degradation Rate = 2 x 10^{-3} hr^{-1}. Volatilization Rate = 3 x 10^{-2} hr^{-1} (G-13) 2.5% theoretical (lb/lb)/BOD_8 with activated sludge. 0 (lb/lb) with BOD_5 and sewage sludge. Biodegrades slowly with acclimated seed. Half-life in less than saturated solution (top meter) is 38.8 minutes as a result of evaporation. 61% evaporates with first .01% of water.(2)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = $10^{2.95}$ (G-14)

BIOACCUMULATION POTENTIAL

Data not available (3)

INHALATION

TLV = 100 ppm (S-12)

RAT LD_{50}

4000-43,000 mg/Kg (2)

ODOR THRESHOLD

.05 ppm; .26-4.13 ppm (2)

TASTE THRESHOLD

.3 ppm (2)

DISCUSSION

DWHI = .001
VHI = 13.2 (TLV)

CHEMICAL NAME

Isobutanol

SYNONYM/OTHER NAMES

Isobutylalcohol, Isopropylcarbinol, 2-Methye Propanol-1

MOLECULAR WEIGHT

74.1 (E-14)

SOLUBILITY

95,000 mg/l @ 18°C (E-14)

DENSITY

0.798 @ 25/4°C (Sp. Gr.) (E-14)

WATER CHEMISTRY

The self purification of surface water is affected at 1.0 mg/l.(E-14)

SOIL ATTENUATION

VOLATILITY

10 mm Hg @ 25°C (E-14)

VAPOR DENSITY

2.55 (E-14)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

BOD$_5$: 64% of ThOD, .07 standard diluted sewage, and 1.66 standard diluted sewage. COD: 100% of ThOD (0.05 n $K_2Cr_2O_7$) (E-14)

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = 0.88 (G-14)

BIOACCUMULATION POTENTIAL

INHALATION

TLV of 100 ppm (E-14)

RAT LD$_{50}$

2460 mg/Kg Oral

ODOR THRESHOLD 1.8 ppm in air

TASTE THRESHOLD

DISCUSSION

DWHI = 1.10
VHI = 26.3 (TLV)

CHEMICAL NAME

n-Butyl Alcohol

SYNONYM/OTHER NAMES

Butanol, Propyl-Carbinol, Butyric Alcohol, 1-Hydroxybutane, n-Propylcarbinol

MOLECULAR WEIGHT

74.12 (3)

SOLUBILITY

90,000 ppm @ 25°C; miscible with alcohol and ether (2)

DENSITY

.811 (Sp. Gr.) (2)

WATER CHEMISTRY

Will be dissolved in water after forming a rapidly spreading slick.(2)

SOIL ATTENUATION

Adsorption proportional to organic content of soils and surface area of clays.(2)

VOLATILITY

5.5 mm Hg @ 20°C (3)

VAPOR DENSITY

2.55 (3)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

BOD_1 -- 41% theoretical using treatment plant activated sludge.
BOD_5 -- 96% theoretical using quiescent activated sludge.
BOD_5 -- 1.1-1.92 lb/lb using sewage seed.
BOD_6 -- 77% theoretical with pure bacterial culture.(2)

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = 0.88 (G-14)

BIOACCUMULATION POTENTIAL

Degrades rapidly (2)

INHALATION

TLV - 100 ppm (3)

RAT LD_{50}

2750 mg/Kg Oral
4360 mg/Kg Oral (2)

ODOR THRESHOLD

2.5 ppm (3)

TASTE THRESHOLD

200 ppm

DISCUSSION

DWHI = 0.955
VHI = 1.45 (TLV)

CHEMICAL NAME

Cacodylic Acid

SYNONYM/OTHER NAMES

Dimethylarsinic Acid, Hydroxydimethylarsine Oxide, Silvisar 510, Alkargin, Chemate, Phytar, Rad-E-Cate

MOLECULAR WEIGHT

138.0 (1)

SOLUBILITY

66.7 g/100 ml (M-10); 83 g/100 g

DENSITY

1.95 g/ml (M-25)

WATER CHEMISTRY

Chemical hydrolysis oxidized to arsenate, precipitates as calcium salt.(22)

SOIL ATTENUATION

Tightly bound to soil particles -- irreversible adsorption.(1) Almost completely inactivated by surface adsorption and ion exchange. No loss from photodecomposition or volatilization.(M-10)

VOLATILITY

VAPOR DENSITY

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Breaks down rapidly in soil.(22) Loss from aerobic and anaerobic soils by alkyl arsine volatility. Anaerobic conditions: 61% converted to organoarsenical in 24 weeks. Aerobic conditions: 35% converted to organoarsenical and 41% to $^{14}CO_2$ and AsO_4^{-3} within 24 weeks.(M-24)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL -- 27,000 for arsenic in crabs (2)

INHALATION

RAT LD_{50}

1280-1400 mg/Kg Oral (22)
700 mg/Kg (96)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 27.2
VHI = N/A

CHEMICAL NAME

Carbon Disulfide

SYNONYM/OTHER NAMES

Carbon Bisulfide, Dithiocarbonic Anhydride

MOLECULAR WEIGHT

76.14 (3)

SOLUBILITY

2200 ppm @ 25°C (2)

DENSITY

1.263 (2)

WATER CHEMISTRY

No reaction with water.(3) Stable to hydrolysis pH 8-10.(M-26)

SOIL ATTENUATION

VOLATILITY

v.p. 260 mm @ 20°C (S-12)

VAPOR DENSITY

2.67 @ 20°C (2)

EVAPORATION RATE

14.4 minute evaporation half-life.(3) 11 minutes half-life saturated water solution.(M-26)

ENVIRONMENTAL PERSISTENCE

Sinks in water and dissolves very slowly.(2)(3) Exposure to sunlight will initiate degradation. Likely to persist in a submerged layer for an extended period. Decomposes readily on standing.(2) Extrapolated half-life value in water, 1.1 year at pH 9. Oxidation rate, 5.6×10^9 $(\text{M-sec})^{-1}$ @ 25°C. Half-life in atmosphere -- 12 days @ 25°C. Photooxidation half-life assuming 12 hours sunlight per day -- 11 days.(M-26)

OCTANOL/WATER PARTITION COEFFICIENT

100 (M-26)

BIOACCUMULATION POTENTIAL

None (3)

INHALATION

TLV - 20 ppm (S-12)

RAT LD_{50}

100-199 mg/Kg (Mammals, Oral) (2)

ODOR THRESHOLD

1.2 mg/m^3 (Medium) (C-11)

TASTE THRESHOLD

0.0026 ppm (Lower) (Q-10)

DISCUSSION

DWHI = 0.629; VHI = 3420 (TLV)

CHEMICAL NAME

2 Chloropropane

SYNONYM/OTHER NAMES

Isopropyl Chloride

MOLECULAR WEIGHT

78.55

SOLUBILITY ·

Slightly soluble in H_2O (S-7) → 200 mg/l

DENSITY

.858 @ 25°C (Sp. Gr.) (S-7)

WATER CHEMISTRY

SOIL ATTENUATION

VOLATILITY

523 mm @ 25°C

VAPOR DENSITY

2.71 (S-7)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

TLV = 50 ppm (S-12)

RAT LD_{50}

Guinea Pig Single Dose
Death = 10,000 mg/Kg (S-12)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 2.86×10^{-4}
VHI = 2750 (TLV)

CHEMICAL NAME

Ortho-Cresol, Meta-Cresol, Para-Cresol (Cresol)

SYNONYM/OTHER NAMES

Cresol, Cresylic Acid, Cresylol, Tricresol, Oxytoluene, Hydroxytoluene, Methaphenols

MOLECULAR WEIGHT

108.13 (3)

SOLUBILITY

2.4-3.1% (2)

DENSITY

1.034-1.048 @ 20°C (M-27)

WATER CHEMISTRY

Acts much like phenol -- forms weakly acid solution. Undergoes additional reactions in presence of acids. Picks up chlorine rapidly, forming more objectionable compounds. Readily oxidized by alkaline solutions to form mixture of products including quinone and phenoquinone.(2)

SOIL ATTENUATION

VOLATILITY

1 mm @ 38-53°C (1)

VAPOR DENSITY

3.72 (2)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

BOD - 1.44-1.70 lb/lb, 5 days -- sewage seed.(3,E-85) May inhibit bacterial action if too concentrated. Biodegrades at moderate pace but can alter aesthetics at very low levels.(2) Photodegradation takes place on standing.

OCTANOL/WATER PARTITION COEFFICIENT -- Log Kow = 1.97 (G-14)

BIOACCUMULATION POTENTIAL

None (3)

INHALATION

22 mg/m^3; TLV - 5 ppm (2)

RAT LD$_{50}$

1350-2020 mg/Kg Oral (C-1

ODOR THRESHOLD

0.016-4.1 ppm (E-63, E-64)

TASTE THRESHOLD

0.002 ppm;(C-1) after chlorination,
0.0001 ppm (2)

DISCUSSION

DWHI = 0.656
VHI = 26.3 (TLV)

CHEMICAL NAME

Cyanogen Chloride

SYNONYM/OTHER NAMES

Chlorine Cyanide

MOLECULAR WEIGHT

61.48 (3)

SOLUBILITY .

2500 ppm @ 25°C (2)

DENSITY

1.186 (Sp. Gr.) (2)

WATER CHEMISTRY

Some will be dissolved in water. Can slowly hydrolyze to release HCN.(2)

SOIL ATTENUATION

Little interaction with soils anticipated.(2)

VOLATILITY

760 mm Hg @ 13.1°C (2)

VAPOR DENSITY

2.1 (2)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Will slowly convert to cyanides. Volatile, and may leave water in gaseous state in warm weather.(2)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

INHALATION

TLV - >0.5 ppm (3)
LC_{50} Inhalation, rat - 117 mg/Kg (30 minutes) (2)

RAT LD_{50}

39 mg/Kg Oral (2)

ODOR THRESHOLD

1 ppm (3); .0025 mg/l in air (E-1)

TASTE THRESHOLD

DISCUSSION

DWHI = 1.83
VHI = 2050 (30 minutes LC_{50}) 4 x 10^5 (TLV)

CHEMICAL NAME

Cyclohexanone

SYNONYM/OTHER NAMES

Cyclohexyl Ketone, Ketoheramethylene, Pimelic Ketone

MOLECULAR WEIGHT

98.15 (3)

SOLUBILITY

24,000 ppm @ 25°C (2)

DENSITY

0.945 @ 20°C (Liquid) (3)

WATER CHEMISTRY

No reactivity with water (3)

SOIL ATTENUATION

Adsorption good on montmorillonite, Cu or Al saturation aids bonding.(2)

VOLATILITY

v.p. 10 mm @ 38.7°C (2)
5 mm @ 26.4°C

VAPOR DENSITY

3.4 (2)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Does not biodegrade well (2)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

None (3)

INHALATION

200 mg/m^3 (2)
TLV - 50 ppm (3)

RAT LD$_{50}$

3460 mg/Kg (P-19)

ODOR THRESHOLD

0.12 ppm (3)

TASTE THRESHOLD

DISCUSSION

DWHI = 0.198
VHI = 12.6 (TLV)

CHEMICAL NAME

1,3 Dichloropropene

SYNONYM/OTHER NAMES

Dichloropropene, Allylene-Dichloride, Telone

MOLECULAR WEIGHT

110.98

SOLUBILITY

cis - .27%; trans - .28% (2)
2700 ppm - 2800 ppm

DENSITY

1.22 @ 25°C (Sp. Gr.) (2)

WATER CHEMISTRY

Will sink to the bottom of the water body and remain there.(2) No reaction with water.(3)

SOIL ATTENUATION

Good adsorption on muck. Adsorption proportional to organic content and surface area of clays.(2) 1-3 isomer data. KOC is 26.3; Kd is 2.75.(G-2)

VOLATILITY

cis - 25 mm Hg @ 20°C; trans - 18.5 mm Hg @ 20°C (G-2)

VAPOR DENSITY

3.8 (2)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Not expected to biodegrade very well.(2)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

May act similar to chlorinated pesticides and concentrate many times.(2)
Food chain concentration potential: none.(3)

INHALATION

TLV = 1.1 ppm (S-12)

RAT LD_{50}

320 mg/Kg Oral
MAC = 0.63 μg/l (307)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 0.250
VHI = 5200 (TLV)
CWHI = 4.3 x 10^6

CHEMICAL NAME

Diethylene Glycol

SYNONYM/OTHER NAMES

Diglycol 2.3-dihydroxyethylether

MOLECULAR WEIGHT

106.12

SOLUBILITY

Miscible (3)

DENSITY

1.1184 gm/cm^3 @ 20°C (3)

WATER CHEMISTRY

No reaction with water (3)

SOIL ATTENUATION

Adsorption proportional to organic content of soil or surface area of clays.(2)

VOLATILITY

0.000033 psia @ 20°C (3)

VAPOR DENSITY

4.39 Kg/m^3 @ 20°C (3)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

5% ThOD in 5 days in freshwater with sewage seed. 30% ThOD in 20 days with sewage seed. Much higher values (43% and 67%, respectively) with acclimated seed.(2)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

None (3)

INHALATION

TLV = 100 ppm (3)

RAT LD$_{50}$

15,650 mg/Kg (2)

ODOR THRESHOLD

1 ppm (S-12)

TASTE THRESHOLD

DISCUSSION

DWHI = .183
VHI = 4.5 x 10^{-3}

CHEMICAL NAME

Diethylene glycol monobutyl ether

SYNONYM/OTHER NAMES

Butyl-carbitol 2-(2-Butoxyethoxy) ethanol

MOLECULAR WEIGHT

162

SOLUBILITY

Soluble in water (55)
→ 1000 mg/l

DENSITY

0.9536 gm/cm^3 @ 20°C (55)

WATER CHEMISTRY

No reaction in water (2)

SOIL ATTENUATION

Adsorption proportional to organic content of soil and surface area of clays (2)

VOLATILITY

0.01 mmHg @ 20°C (55)

VAPOR DENSITY

6.72 Kg/m^3 @ 20°C (2)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Should degrade biologically at a moderate rate (2)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

Other glycols have no bioaccumulation potential

INHALATION

RAT LD_{50}

6560 mg/Kg (Oral) (2)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = .436

CHEMICAL NAME

Ethylene glycol monoethyl ether

SYNONYM/OTHER NAMES

Butyl cellosolve

MOLECULAR WEIGHT

76.11

SOLUBILITY

infinite solubility (J3)

DENSITY

0.9647 gm/cm^3 @ 20°C (3)

WATER CHEMISTRY

No reaction with water (1)

SOIL ATTENUATION

Adsorption proportional to organic content of soils and surface area of clays (2)

VOLATILITY

0.074 psia @ 20°C (3)

VAPOR DENSITY

0.0012 #/ft^3 @ 20°C (3)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

36% ThOD in freshwater after 5 days with sewage seed. 100% ThOD in freshwater after 20 days with sewage seed. (2)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL -- None (3)

INHALATION

50 ppm (1) TLV

RAT LD$_{50}$

1480 mg/Kg (1)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 19.3
VHI = 20.1

CHEMICAL NAME

Ethylene Glycol Monobutyl Ether

SYNONYM/OTHER NAMES

Butyl Cellosolve, Dowanol EB, Soly-SolvEB, 2-Butoxyethanol

MOLECULAR WEIGHT

118.18

SOLUBILITY

Miscible (3)

DENSITY

56.3 lb/ft^3 @ 20°C (3)

WATER CHEMISTRY

No reaction with water (3)

SOIL ATTENUATION

Adsorption proportional to organic content of soils and surface areas of clays (2)

VOLATILITY

0.012 psia @ 20°C (3)

VAPOR DENSITY

0.00040 lb/ft^3 @ 20°C (3)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

26% ThOD in 5 days in freshwater with sewage seed. 88% ThOD in 20 days in freshwater with sewage seed. (2)

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

None (3)

INHALATION

TLV = 50 ppm (S-12)

RAT LD_{50}

500-5000 mg/Kg; 700 ppm (Mice, LC_{50}) (2)

ODOR THRESHOLD -- 0.48 ppm (S-12

TASTE THRESHOLD

DISCUSSION

DWHI = 1.14
VHI = 3.26 (TVL)

CHEMICAL NAME

Ethyl Ether, Diethyl Ether, Ethoxyethane, Ethyl Oxide (Ethyl Ether)

SYNONYM/OTHER NAMES

Ether, Sulfuric Ether, Diethyl Oxide

MOLECULAR WEIGHT

74.12 (2)

SOLUBILITY

7500 ppm @ 25°C (2)

DENSITY

0.7134 (Liquid) (2)

WATER CHEMISTRY

No reaction with water (3)

SOIL ATTENUATION

VOLATILITY

442 mm Hg @ 20°C (2)

VAPOR DENSITY

2.60 (2)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

BOD_5 = 0.03 standard dilute sewage.(S-12) Does not degrade rapidly but will volatilize and disperse after short period of time.(2) Relatively inert to chemical attach.(3) BOD, .03 lb/lb, 5 days sewage seed.(E-85) BOD, 3% in 5 days.(3)

OCTANOL/WATER PARTITION COEFFICIENT

Log Kow = 0.53 (G-14)

BIOACCUMULATION POTENTIAL

None (3)

INHALATION

1200 mg/m^3 (2) TLV - 400 ppm (3)

RAT LD_{50}

3560 mg/Kg (P-33)

ODOR THRESHOLD

0.83 ppm (3)

TASTE THRESHOLD

DISCUSSION

DWHI = .06
VHI = 291

CHEMICAL NAME

Methyl Ethyl Ketone

SYNONYM/OTHER NAMES

2-Butanone, MEK

MOLECULAR WEIGHT

72.1

SOLUBILITY

100,000 ppm @ 25°C (2)

DENSITY

.805 (Sp. Gr.) (2)

WATER CHEMISTRY

Will dissolve into water, normally floats and mixes with H_2O.(2)

SOIL ATTENUATION

Will absorb onto montmorillonite. Aluminum and copper saturation helps bonding. Calcium and hydrogen bentonite are effective.(2)

VOLATILITY

100 mm Hg @ 25°C, 71.2 mm Hg @ 20°C (2)

VAPOR DENSITY

2.41 (2)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

2.14 (lb/lb) BOD_5 with sewage sludge seed. Biodegrades quite rapidly.(2)

OCTANOL/WATER PARTITION COEFFICIENT -- ThOD = 2.44 (S-12) Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

None (2)

INHALATION

TLV = 200 ppm (S-12)

RAT LD_{50}

3980 mg/Kg

ODOR THRESHOLD

10-25 ppm

TASTE THRESHOLD

DISCUSSION

DWHI = .72
VHI = 132 (TLV)

CHEMICAL NAME

Methyl Isobutyl Ketone

SYNONYM/OTHER NAMES

Isopropylacetone, 4 Methyl-2 Pentanone, Hexone

MOLECULAR WEIGHT

100.16

SOLUBILITY

19,000 ppm @ 25°C (2)

DENSITY

.801 @ 25°C (Sp. Gr.) (2)

WATER CHEMISTRY

Will float on surface at first, but should dissolve at a moderate rate. No reaction with water.(2)

SOIL ATTENUATION

Absorbed onto montmorillonite. Aluminum and copper saturation helps in bonding.(2)

VOLATILITY

16 mm Hg @ 20°C (2)

VAPOR DENSITY

3.45 (2)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

Biodegrades at a slow rate. BOD_5 is 1.8% theoretical (lb/lb) with activated sludge seed.(2) BOD_5 = 4.4% ThOD BOD_{20} = 56.6% ThOD

OCTANOL/WATER PARTITION COEFFICIENT

-- Kow = 1 (G-13) BOD_{50} = 64.8% ThOD
ThOD = 2.72 (S-12)

BIOACCUMULATION POTENTIAL

None (3)

INHALATION

TLV = 100 ppm

RAT LD_{50}

2080 mg/Kg Oral

ODOR THRESHOLD

.47 ppm (3)

TASTE THRESHOLD

DISCUSSION

DWHI = .251
VHI = 42.1 (TLV)

CHEMICAL NAME

Trichloro,Trifluoroethane (Freon)

SYNONYM/OTHER NAMES

MOLECULAR WEIGHT

187.39

SOLUBILITY

Saturation Concentration = 2754 mg/l
20°C; Insoluble in Water (S6) → 10 mg/l

DENSITY

1.567 gm/cm^3 @ 20°C (S6)

WATER CHEMISTRY

Hydrolysis rate in neutral aqueous solutions at room temperature is quite slow.(S-32)

SOIL ATTENUATION

Should not interact with the soil due to high volatility.(S-32)

VOLATILITY

270 mm Hg @ 20°C (S-12); 400 mm Hg @ 30.2°C (S-6)

VAPOR DENSITY

6.47 (G-1)

EVAPORATION RATE

1.95 times rate of ether (G-1)

ENVIRONMENTAL PERSISTENCE

Although resistant to biological breakdown, fluorocarbons are not persistent in an aqueous environment because of high volatility. Compounds are very stable in the atmosphere.(S-32)

OCTANOL/WATER PARTITION COEFFICIENT

Kow = 100 (G-13)

BIOACCUMULATION POTENTIAL

Fluorocarbons are readily eliminated from the body through the respiratory system. Therefore, they should not accumulate in higher organisms.(S-32)

INHALATION

TLV = 1000 ppm

RAT LD_{50}

ODOR THRESHOLD

68 ppm (Medium) (E-1)

TASTE THRESHOLD

DISCUSSION

DWHI = N/A
VHI = 105

CHEMICAL NAME

Triethylene glycol

SYNONYM/OTHER NAMES

Triglycol

MOLECULAR WEIGHT

150.17

SOLUBILITY

Infinitely soluble (56)

DENSITY

70.3 lb/ft^3 @ 20°C (3)

WATER CHEMISTRY

No reaction with water (3)

SOIL ATTENUATION

Adsorption proportional to organic content of soils and surface area of clays (2)

VOLATILITY

1mmHg @ 114°C (56)

VAPOR DENSITY

6.20 Kg/m^3 @ 20°C (2)

EVAPORATION RATE

ENVIRONMENTAL PERSISTENCE

4% ThOD in 5 days in fresh water with sewage seed. 24% ThOD in 20 days in fresh water with sewage seed. Higher values (32 and 86%, respectively) with acclimated seed.

OCTANOL/WATER PARTITION COEFFICIENT -- Kow = 1 (G-13)

BIOACCUMULATION POTENTIAL

Very low. Rats and rabbits excrete 91-98% in 5 days, mostly in urine. Some is metabolized while 30-40% remains unchanged. (2)

INHALATION

RAT LD_{50}

22,060 mg/Kg (2)

ODOR THRESHOLD

TASTE THRESHOLD

DISCUSSION

DWHI = 1.3
VHI = N/A

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Section II - Fate and Transport Potential of the Hazardous Constituents*

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*This section of the appendix describes the migratory potential/ persistence of approximately 89 of the hazardous constituents identified in Section I of this appendix based on a "model" described in Attachment 1 in this section to this appendix.

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ACETALDEHYDE

THE POTENTIAL RELEASE RATES OF ACETALDEHYDE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF ACETALDEHYDE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF ACETALDEHYDE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~.
ATTACHMENT 1.

ACETALDEHYDE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 600 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 2400 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 8800 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO ACETALDEHYDE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF ACETALDEHYDE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~.
ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF ACETALDEHYDE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .13 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, WITH APPROXIMATELY 97 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED ACETALDEHYDE IN A RIVER REACH TRAVERSED IN 5 DAYS IS LOW, WITH APPROXIMATELY .13 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING ACETALDEHYDE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000017 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING ACETALDEHYDE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000080% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ACETALDEHYDE IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A

RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS SIGNIFICANT RANGING FROM 25 % TO 60 %.

MOVEMENT OF ACETALDEHYDE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 1.7 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS HIGH WITH APPROXIMATELY98 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED ACETALDEHYDE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY 1.7 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00094 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING ACETALDEHYDE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000019% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ACETALDEHYDE IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY 5.0 %.

MOVEMENT OF ACETALDEHYDE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .45 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , WITH APPROXIMATELY 100 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED ACETALDEHYDE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 100 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0010 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT ACETALDEHYDE LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000011% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ACETALDEHYDE IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS SIGNIFICANT, RANGING FROM 6.4 % TO 12 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- ACETALDEHYDE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	10000	1
RATIO OF MOLECULAR WEIGHTS OF ACETALDEHYDE TO OXYGEN	1.4	2
OCTANOL/WATER PARTITION COEFFICIENT	1.0	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	.53	4
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.53	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF ACETALDEHYDE

1 Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by the U.S. Environmental Protection Agency.

2 Perry, R. H., C. H. Chilton and S. D. Kirkpatrick, Perry's Chemical Engineering Handbook, Fourth Edition, McGraw-Hill Book Company, New York (1963), p. 3-23.

3 Values of Kow based on Koc/Solubility Correlation developed by SRI International, J. H. Smith and D. C. Bomberger.

4 Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS). Files maintained by the U.S. EPA.

ACETONITRILE

THE POTENTIAL RELEASE RATES OF ACETONITRILE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF ACETONITRILE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF ACETONITRILE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

ACETONITRILE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 1300 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 5200 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 19000 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO ACETONITRILE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF ACETONITRILE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF ACETONITRILE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .10 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, WITH APPROXIMATELY 98 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED ACETONITRILE IN A RIVER REACH TRAVERSED IN 5 DAYS IS LOW, WITH APPROXIMATELY .10 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING ACETONITRILE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.1 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000060 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING ACETONITRILE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000043% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ACETONITRILE IN FISH MAY BE 0.3 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A

RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS SIGNIFICANT RANGING FROM 25 % TO 60 %.

MOVEMENT OF ACETONITRILE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 1.6 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS HIGH WITH APPROXIMATELY98 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED ACETONITRILE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY 1.6 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00043 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 0.1 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING ACETONITRILE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000010% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ACETONITRILE IN FISH MAY BE 0.3 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY 5.0 %.

MOVEMENT OF ACETONITRILE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .43 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , WITH APPROXIMATELY 100 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED ACETONITRILE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 100 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.1 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00046 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT ACETONITRILE LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000005% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ACETONITRILE IN FISH MAY BE 0.3 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS SIGNIFICANT, RANGING FROM 6.4 % TO 12 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- ACETONITRILE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	100000	1
RATIO OF MOLECULAR WEIGHTS OF ACETONITRILE TO OXYGEN	1.3	2
OCTANOL/WATER PARTITION COEFFICIENT	.46	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	.040	4
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.55	5

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF ACETONITRILE

1 Criteria Document prepared for Priority Pollutants per section 307 of the Federal Water Pollution Control Act and Clean Water Act as amended under contract for the U.S. Environmental Protection Agency.

2 Weast, R. C., and M. J. Astle, Handbook of Chemistry and Physics, 59th Edition, CRC Press, Inc., West Palm Beach, 1978, p. C-87.

3 Compilation of solvent water partition coefficients as reported in the literature. Developed and maintained by Dr. Corlan Hansch, Pomona College, Pomona, California.

4 Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by the U.S. Environmental Protection Agency.

5 Verscheuren, K., 1977. Handbook of Environmental Data on Organic Chemicals, Van Nostrand Reinhold Co., New York.

ACETOPHENONE

The potential release rates of ACETOPHENONE from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of ACETOPHENONE that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of ACETOPHENONE can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1.

ACETOPHENONE was found to be a contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from 15 mg per square meter of surface area per fraction of the waste stream per year to 62 mg per square meter of surface area per fraction of the waste stream per year for landfills and 230 mg per square meter of surface area per fraction of the waste stream per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to ACETOPHENONE through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of ACETOPHENONE that determine its movement and degredation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of ACETOPHENONE downstream from points of discharge in rivers is projected to be significant. Based on the analysis performed, between 62 % and 70 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The potential for degradation or elimination of this compound from a river reach traversed in 5 days is significant, ranging from 30 % to 38 % of the total amount emitted. The projected amount of dissolved ACETOPHENONE in a river reach traversed in 5 days is significant, ranging from 62 % to 70 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving ACETOPHENONE is low. Concentration in the sediment may be 9.7 times as great as ambient water concentration. Based on the analysis performed, approximately .028 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving ACETOPHENONE is low. Based on the analysis performed, approximately .000039 % of the amount emitted will be taken up by fish. Concentrations of ACETOPHENONE in fish may be 9.2 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a river reach traversed in 5 days (50 to 250 miles) is significant ranging from 3,1 % to 12 %.

Movement of ACETOPHENONE through ponds and small reservoirs is projected to be significant. Based on the analysis performed, approximately 13 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The potential for degradation or elimination of this compound in such a pond is high with approximately 86 % of the total amount emitted. The projected amount of dissolved ACETOPHENONE in a pond characterized by a retention time of 100 days is significant, with approximately 13 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is low. Based on the analysis performed, approximately .037 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 9.7 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving ACETOPHENONE is low. Based on the analysis performed, approximately .000023 % of the amount emitted will be taken up by fish. Concentrations of ACETOPHENONE in fish may be 9.2 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a pond surface with a retention time of 100 days is low, with approximately 1.5 %.

Movement of ACETOPHENONE through reservoirs and lakes is projected to be limited. Based on the analysis performed, approximately 3.9 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The potential for degradation or elimination of this compound in such a reservoir or lake is high , with approximately 96 % of the total amount emitted. The projected amount of dissolved ACETOPHENONE in a reservoir or lake characterized by a retention time of 365 days is low, with approximately 96 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is low. Concentration in the sediment may be 9.7 times as great as ambient water concentration. Based on the analysis performed, approximately .039 % of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant ACETOPHENONE loads is low. Based on the analysis performed, approximately .000014 % of the amount emitted will be taken up by fish. Concentrations of ACETOPHENONE in fish may be 9.2 times as great as dissolved concentrations. Estimated potential release from a reservoir or lake with an average retention time of 365 days is low with approximately 2.1 %.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- ACETOPHENONE -----

Parameter	Value	Referen
Solubility (mg/l)	5500	1
Ratio of molecular weights of ACETOPHENONE to oxygen	.63	2
Octanol/Water Partition Coefficient	39	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	n.a.	
Microbial degradation rate constant (/days)	n.a.	
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	.065	4

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicate a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of ACETOPHENONE

1 "Chemical Hazards Response Information System (CHRIS); Hazardous Chemical Data," CG-446-2, U.S. Coast Guard, 1974.

2 Weast, R. C., and M. J. Astle, Handbook of Chemistry and Physics, 59th Edition, CRC Press, Inc., West Palm Beach, 1978, p. C-98.

3 Values of Kow were calculated using a computer routine developed at SRI by Johnson and Leibrand (1980) which uses group values reported by Hansch and Leo (1979).

4 Mill, T., W. R. Mabey, D. W. Hendry and T. W. Chou, Best estimate by SRI International.

ACETYL CHLORIDE

THE POTENTIAL RELEASE RATES OF ACETYL CHLORIDE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF ACETYL CHLORIDE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF ACETYL CHLORIDE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

ACETYL CHLORIDE WAS FOUND TO BE THE MAJOR CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE APPROXIMATELY .00 MG PER SQUARE METER OF SURFACE AREA PER YEAR' FOR LANDFILLS AND .00 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LAGOONS. APPROXIMATELY .00 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY .00 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO ACETYL CHLORIDE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF ACETYL CHLORIDE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A.~~ ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF ACETYL CHLORIDE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 9.1 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A

RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, WITH APPROXIMATELY 91 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED ACETYL CHLORIDE IN A RIVER REACH TRAVERSED IN 5 DAYS IS LOW, WITH APPROXIMATELY 9.1 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING ACETYL CHLORIDE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000076 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING ACETYL CHLORIDE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000017% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ACETYL CHLORIDE IN FISH MAY BE 0.1 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RIVERS

TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF ACETYL CHLORIDE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 2.0 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS HIGH WITH APPROXIMATELY98 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED ACETYL CHLORIDE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY 2.0 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000075 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 0.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING ACETYL CHLORIDE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000003% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ACETYL CHLORIDE IN FISH MAY BE 0.1 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE PONDS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF ACETYL CHLORIDE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .57 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , WITH APPROXIMATELY 99 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED ACETYL CHLORIDE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 99 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000080 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT ACETYL CHLORIDE LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000002% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ACETYL CHLORIDE IN FISH MAY BE 0.1 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RESERVOIRS OR LAKES TO THE ATMOSPHERE SHOULD OCCUR.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- ACETYL CHLORIDE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	1000000	1
RATIO OF MOLECULAR WEIGHTS OF ACETYL CHLORIDE TO OXYGEN	2.5	2
OCTANOL/WATER PARTITION COEFFICIENT	.080	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	.48	4
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.48	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF ACETYL CHLORIDE

1 Criteria Document prepared for Priority Pollutants per section 307 of the Federal Water Pollution Control Act and the Clean Water Act as amended under contract for the U.S. Environmental Protection Agency.

2 Weast, R. C., and M. J. Astle, Handbook of Chemistry and Physics, 59th Edition, CRC Press, Inc., West Palm Beach, 1978, p. C-86.

3 Values of Kow were calculated using a computer routine developed at SRI by Johnson and Leibrand (1980) which uses group values reported by Hansch and Leo (1979).

4 Mill, T., W. R. Mabey, D. W. Hendry and T. W. Chou, Best estimate by SRI International.

ACROLEIN

THE POTENTIAL RELEASE RATES OF ACROLEIN FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF ACROLEIN THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF ACROLEIN CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

ACROLEIN WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 600 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 2400 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 8800 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO ACROLEIN THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF ACROLEIN THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF ACROLEIN DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 2.0 % AND 29 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, RANGING FROM 71 % TO 98 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED ACROLEIN IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 2.0 % TO 29 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING ACROLEIN IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00025 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING ACROLEIN IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000017 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ACROLEIN IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED

IN 5 DAYS (50 TO 250 MILES) IS HIGH RANGING FROM 48 % TO 88 %.

MOVEMENT OF ACROLEIN THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 7.4 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS HIGH WITH APPROXIMATELY91 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED ACROLEIN IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY 7.4 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00094 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING ACROLEIN IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000083% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ACROLEIN IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 22 % TO 33 %.

MOVEMENT OF ACROLEIN THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 1.9 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , WITH APPROXIMATELY 98 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED ACROLEIN IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 96 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0010 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT ACROLEIN LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000044% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ACROLEIN IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS SIGNIFICANT, RANGING FROM 28 % TO 44 %.

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----- ACROLEIN -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	400000	1
RATIO OF MOLECULAR WEIGHTS OF ACROLEIN TO OXYGEN	1.8	2
OCTANOL/WATER PARTITION COEFFICIENT	1.0	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	.080	4
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.080	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

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1 Daniels, S. L., W. B. Neely and R. E. Bailey, "Toxic 'Priority' Pollutant Perspectives," Environmental Sciences Research, Dow Chemical Company, May 9, 1979.

2 Weed Science Society of America. 1979. Herbicide Handbook, 4th Edition.

3 Values of Kow based on Koc/Solubility Correlation developed by SRI International, J. H. Smith and D. C. Bomberger.

4 Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by the U.S. Environmental Protection Agency.

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ACRYLAMIDE

THE POTENTIAL RELEASE RATES OF ACRYLAMIDE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF ACRYLAMIDE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF ACRYLAMIDE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

ACRYLAMIDE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 6000 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 24000 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 88000 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO ACRYLAMIDE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF ACRYLAMIDE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

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MOVEMENT OF ACRYLAMIDE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 2.7 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, WITH APPROXIMATELY 97 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED ACRYLAMIDE IN A RIVER REACH TRAVERSED IN 5 DAYS IS LOW, WITH APPROXIMATELY 2.7 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING ACRYLAMIDE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000029 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING ACRYLAMIDE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000014% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ACRYLAMIDE IN FISH MAY BE 0.1 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RIVERS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF ACRYLAMIDE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 1.4 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS HIGH WITH APPROXIMATELY99 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED ACRYLAMIDE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY 1.4 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000094 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 0.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING ACRYLAMIDE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000002% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ACRYLAMIDE IN FISH MAY BE 0.1 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE PONDS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF ACRYLAMIDE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .38 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , WITH APPROXIMATELY 100 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED ACRYLAMIDE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 100 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00010 % OF THE

AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT ACRYLAMIDE LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000001% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ACRYLAMIDE IN FISH MAY BE 0.1 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RESERVOIRS OR LAKES TO THE ATMOSPHERE SHOULD OCCUR.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- ACRYLAMIDE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	2200000	1
RATIO OF MOLECULAR WEIGHTS OF ACRYLAMIDE TO OXYGEN	2.2	2
OCTANOL/WATER PARTITION COEFFICIENT	.10	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	.72	4
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.72	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF ACRYLAMIDE

1 Davis, L. N., P. R. Durkin, P. H. Howard and J. Sakena, Investigation of Selected Potential Environmental Contaminants: Acrylamides, EPA Report 560/2-76-008, August 1976.

2 Weast, R. C., and M. J. Astle, Handbook of Chemistry and Physics, 59th Edition, CRC Press, Inc., West Palm Beach, 1978, p. C-451.

3 Values of Kow were calculated using a computer routine developed at SRI by Johnson and Leibrand (1980) which uses group values reported by Hansch and Leo (1979).

4 Verschueren, K., 1977. Handbook of Environmental Data on Organic Chemicals. Van Nostrand Reinhold Co., New York.

ACRYLONITRILE

THE POTENTIAL RELEASE RATES OF ACRYLONITRILE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF ACRYLONITRILE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF ACRYLONITRILE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

ACRYLONITRILE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 430 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 1700 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 6400 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO ACRYLONITRILE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF ACRYLONITRILE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF ACRYLONITRILE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 1.6 % AND 25 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, RANGING FROM 75 % TO 98 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED ACRYLONITRILE IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 1.6 % TO 25 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING ACRYLONITRILE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.3 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00027 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING ACRYLONITRILE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000020 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ACRYLONITRILE IN FISH MAY BE 0.8 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE

TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS HIGH RANGING FROM 46 % TO 85 %.

MOVEMENT OF ACRYLONITRILE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 6.0 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS HIGH WITH APPROXIMATELY93 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED ACRYLONITRILE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY 6.0 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0013 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 0.3 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING ACRYLONITRILE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000086% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ACRYLONITRILE IN FISH MAY BE 0.8 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 18 % TO 28 %.

MOVEMENT OF ACRYLONITRILE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 1.5 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , WITH APPROXIMATELY 98 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED ACRYLONITRILE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 98 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.3 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0014 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT ACRYLONITRILE LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000046% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ACRYLONITRILE IN FISH MAY BE 0.8 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS SIGNIFICANT, RANGING FROM 23 % TO 37 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- ACRYLONITRILE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	74000	1
RATIO OF MOLECULAR WEIGHTS OF ACRYLONITRILE TO OXYGEN	1.7	2
OCTANOL/WATER PARTITION COEFFICIENT	1.4	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	.11	4
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.11	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF ACRYLONITRILE

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1 Criteria Document prepared for Priority Pollutants per Section 307 of the Federal Water Pollution Control Act and Clean Water Act as amended under contract for the U.S. Environmental Protection Agency.

2 Weast, R. C., and M. J. Astle, Handbook of Chemistry and Physics, 59th Edition, CRC Press, Inc., West Palm Beach, 1978, p. C-465.

3 Compilation of solvent water partition coefficients as reported in the literature. Developed and maintained by Dr. Corlan Hansch, Pomona College, Pomona, California.

4 Center for Chemical Hazard Assessment, Syracuse Research Corp., Acyrlonitrile Hazard Profile, Environmental Criteria and Assessment Office, U.S. Environmental Protection Agency, Cincinnati, Ohio, 1980.

ALDRIN

THE POTENTIAL RELEASE RATES OF ALDRIN FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF ALDRIN THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF ALDRIN CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~.
ATTACHMENT 1.

ALDRIN WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM .038 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO .15 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND .55 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO ALDRIN THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF ALDRIN THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~.
ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF ALDRIN DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE WIDESPREAD. BASED ON THE ANALYSIS PERFORMED, BETWEEN 88 % AND 95 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 5.0 % TO 12 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED ALDRIN IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 32 % TO 75 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING ALDRIN IS HIGH. CONCENTRATION IN THE SEDIMENT MAY BE 4000.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, BETWEEN 13 % AND 63 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING ALDRIN IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0034 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ALDRIN IN FISH MAY BE 839.3 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RIVERS TO THE ATMOSPHERE SHOULD

OCCUR.

MOVEMENT OF ALDRIN THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 9.1 % AND 22 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS SIGNIFICANT RANGING FROM 26 % TO 65 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED ALDRIN IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 8.6 % TO 21 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS HIGH. BASED ON THE ANALYSIS PERFORMED, BETWEEN 13 % AND 65 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 4000.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING ALDRIN IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0034 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ALDRIN IN FISH MAY BE 839.3 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE PONDS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF ALDRIN THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 2.8 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS SIGNIFICANT , RANGING FROM 31 % TO 79 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED ALDRIN IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 31 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS HIGH. CONCENTRATION IN THE SEDIMENT MAY BE 4000.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, BETWEEN 14 % AND 66 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT ALDRIN LOADS IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0024 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ALDRIN IN FISH MAY BE 839.3 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RESERVOIRS OR LAKES TO THE ATMOSPHERE SHOULD OCCUR.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- ALDRIN -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	.025	1
RATIO OF MOLECULAR WEIGHTS OF ALDRIN TO OXYGEN	11	2
OCTANOL/WATER PARTITION COEFFICIENT	16000	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	.00020	4
PHOTOLYSIS RATE CONSTANT (/DAYS)	.031	5
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.031	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF ALDRIN

1 Chemical Week Pesticide Register.

2 E. Y. Spencer, "Guide to the Chemicals Used in Crop Protection," Publication 1093, 6th Edition, Research Institute, Research Branch, Agriculture Canada, 1973, p.

3 Values of Kow based on Koc/Solubility Correlation developed by SRI International, J. H. Smith and D. C. Bomberger.

4 Goring, C. A. I. and J. H. Hamaker, Organic Chemicals in the Soil Environment, Marcel Dekker, New York, 1972.

5 Faust, S. D. and J. V. Hunter, Organic Compounds in Aquatic Environments, Marcel Dekker, New York, 1971.

ANTIMONY PENTACHLORIDE

THE POTENTIAL RELEASE RATES OF ANTIMONY PENTACHLORIDE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF ANTIMONY PENTACHLORIDE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF ANTIMONY PENTACHLORIDE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

ANTIMONY PENTACHLORIDE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 600 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 2400 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 8800 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO ANTIMONY PENTACHLORIDE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF ANTIMONY PENTACHLORIDE THAT DETERMINE ITS MOVEMENT AND DEGRADATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF

THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT 1. BECAUSE NO DEGRADATION DATA WERE AVAILABLE, THE RESULTS OF THE ANALYSIS SUBSEQUENTLY PRESENTED PROVIDES ESTIMATES OF THE RELATIVE PARTITIONING ONLY BETWEEN AIR, WATER, AND SEDIMENT MEDIA.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF ANTIMONY PENTACHLORIDE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 22 % AND 70 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE PROJECTED AMOUNT OF DISSOLVED ANTIMONY PENTACHLORIDE IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 22 % TO 70 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING ANTIMONY PENTACHLORIDE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00073 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING ANTIMONY PENTACHLORIDE IS LOW. BASED ON THE

ANALYSIS PERFORMED, APPROXIMATELY .0000025 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ANTIMONY PENTACHLORIDE IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS SIGNIFICANT RANGING FROM 30 % TO 78 %.

MOVEMENT OF ANTIMONY PENTACHLORIDE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 34 % AND 48 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE PROJECTED AMOUNT OF DISSOLVED ANTIMONY PENTACHLORIDE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 34 % TO 48 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00097 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING ANTIMONY PENTACHLORIDE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000038 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ANTIMONY PENTACHLORIDE IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 52 % TO 66 %.

MOVEMENT OF ANTIMONY PENTACHLORIDE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 8.9 % AND 16 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE PROJECTED AMOUNT OF DISSOLVED ANTIMONY PENTACHLORIDE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS SIGNIFICANT, RANGING FROM 84 % TO 91 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0010 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT ANTIMONY PENTACHLORIDE LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000021 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ANTIMONY PENTACHLORIDE IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS HIGH, RANGING FROM 84 % TO 91 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- ANTIMONY PENTACHLORIDE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	1000000	1
RATIO OF MOLECULAR WEIGHTS OF ANTIMONY PENTACHLORIDE TO OXYGEN	9.3	2
OCTANOL/WATER PARTITION COEFFICIENT	1.0	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATES A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF ANTIMONY PENTACHLORIDE

1 Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. B-96.

2 Criteria Document prepared for Priority Pollutants per Section 307 of the Federal Water Pollution Control Act and the Clean Water Act as amended under contract for the U.S. Environmental Protection Agency.

3 Values of Kow based on Kow/solubility correlation developed by SRI International, J. H. Smith and D. C. Bomberger.

ANTIMONY TRICHLORIDE

THE POTENTIAL RELEASE RATES OF ANTIMONY TRICHLORIDE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF ANTIMONY TRICHLORIDE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF ANTIMONY TRICHLORIDE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

ANTIMONY TRICHLORIDE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 600 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 2400 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 8800 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO ANTIMONY TRICHLORIDE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF ANTIMONY TRICHLORIDE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF

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POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF ANTIMONY TRICHLORIDE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 18 % AND 66 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE PROJECTED AMOUNT OF DISSOLVED ANTIMONY TRICHLORIDE IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 18 % TO 66 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING ANTIMONY TRICHLORIDE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00070 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING ANTIMONY TRICHLORIDE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000024 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ANTIMONY TRICHLORIDE IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS HIGH RANGING FROM 34 % TO 82 %.

MOVEMENT OF ANTIMONY TRICHLORIDE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 31 % AND 44 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE PROJECTED AMOUNT OF DISSOLVED ANTIMONY TRICHLORIDE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 31 % TO 44 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00097 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING ANTIMONY TRICHLORIDE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000035 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ANTIMONY TRICHLORIDE IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 56 % TO 69 %.

MOVEMENT OF ANTIMONY TRICHLORIDE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 7.8 % AND 15 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE PROJECTED AMOUNT OF DISSOLVED ANTIMONY TRICHLORIDE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS SIGNIFICANT, RANGING FROM 85 % TO 92 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0010 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT ANTIMONY TRICHLORIDE LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000019 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ANTIMONY TRICHLORIDE IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS HIGH, RANGING FROM 85 % TO 92 %.

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----- ANTIMONY TRICHLORIDE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	1000000	1
RATIO OF MOLECULAR WEIGHTS OF ANTIMONY TRICHLORIDE TO OXYGEN	7.1	2
OCTANOL/WATER PARTITION COEFFICIENT	1.0	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATES A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

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2 Weast, R. C., Ed., Handbook of Chemistry and Physics, 48th Ed., Cleveland, Chemical Rubber Company, 1969, 2100 p.

3 Values of Kow based on Kow/solubility correlation developed by SRI, International J. H. Smith and D. C. Bomberger.

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ARSENIC

THE POTENTIAL RELEASE RATES OF ARSENIC FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF ARSENIC THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF ARSENIC CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT 1.

ARSENIC WAS FOUND TO BE THE MAJOR CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 750000 MG PER SQUARE METER OF SURFACE AREA PER YEAR TO 3000000 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LANDFILLS AND .00 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO ARSENIC THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF ARSENIC THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT 1. BECAUSE NO DEGRADATION DATA WERE AVAILABLE, THE RESULTS OF THE ANALYSIS SUBSEQUENTLY PRESENTED PROVIDES ESTIMATES OF

THE RELATIVE PARTITIONING ONLY BETWEEN AIR, WATER, AND SEDIMENT MEDIA.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF ARSENIC DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE WIDESPREAD. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 100 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE PROJECTED AMOUNT OF DISSOLVED ARSENIC IN A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, WITH APPROXIMATELY 100 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING ARSENIC IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0010 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING ARSENIC IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000029 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ARSENIC IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RIVERS TO THE ATMOSPHERE SHOULD

OCCUR.

MOVEMENT OF ARSENIC THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE WIDESPREAD. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 100 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE PROJECTED AMOUNT OF DISSOLVED ARSENIC IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS HIGH, WITH APPROXIMATELY 100 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0010 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING ARSENIC IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000011 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ARSENIC IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE PONDS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF ARSENIC THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE WIDESPREAD. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 100 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE PROJECTED AMOUNT OF DISSOLVED ARSENIC IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS HIGH, WITH APPROXIMATELY .0044 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0010 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND

RESERVOIRS RECEIVING SIGNIFICANT ARSENIC LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000024 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF ARSENIC IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RESERVOIRS OR LAKES TO THE ATMOSPHERE SHOULD OCCUR.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- - ARSENIC -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	5000	1
RATIO OF MOLECULAR WEIGHTS OF ARSENIC TO OXYGEN	9.4	2
OCTANOL/WATER PARTITION COEFFICIENT	1.0	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATES A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF ARSENIC

BENZOANTHRACENE

The potential release rates of BENZOANTHRACENE from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of BENZOANTHRACENE that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of BENZOANTHRACENE can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1.

BENZOANTHRACENE was found to be the major contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from 1.6 mg per square meter of surface area per year to 6.6 mg per square meter of surface area per year for landfills and .00 mg per square meter of surface area per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters. BENZOANTHRACENE was found to be a contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from .0014 mg per square meter of surface area per fraction of the waste stream per year to .0056 mg per square meter of surface area per fraction of the waste stream per year for landfills and .021 mg per square meter of surface area per fraction of the waste stream per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to BENZOANTHRACENE through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of BENZOANTHRACENE that determine its movement and degredation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of BENZOANTHRACENE downstream from points of discharge in rivers is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The potential for degradation or elimination of this compound from a river reach traversed in 5 days is low, with approximately .028 % of the total amount emitted. The projected amount of dissolved BENZOANTHRACENE in a river reach traversed in 5 days is significant, ranging from 1.8 % to 18 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving BENZOANTHRACENE is high. Concentration in the sediment may be 106750.0 times as great as ambient water concentration. Based on the analysis performed, between 82 % and 98 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving BENZOANTHRACENE is high. Based on the analysis performed, approximately .0090 % of the amount emitted will be taken up by fish. Concentrations of BENZOANTHRACENE in fish may be 9855.4 times as great as dissolved concentrations. Virtually no releases from the rivers to the atmosphere should occur.

Movement of BENZOANTHRACENE through ponds and small reservoirs is projected to be significant. Based on the analysis performed, between 4.3 % and 23 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The potential for degradation or elimination of this compound in such a pond is low with approximately .49 % of the total amount emitted. The projected amount of dissolved BENZOANTHRACENE in a pond characterized by a retention time of 100 days is significant, ranging from 1.6 % to 15 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is high. Based on the analysis performed, between 80 % and 98 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 106750.0 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving BENZOANTHRACENE is high. Based on the analysis performed, approximately .028 % of the amount emitted will be taken up by fish. Concentrations of BENZOANTHRACENE in fish may be 9855.4 times as great as dissolved concentrations. Virtually no releases from the ponds to the atmosphere should occur.

Movement of BENZOANTHRACENE through reservoirs and lakes is projected to be significant. Based on the analysis performed, between 1.6 % and 12 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The potential for degradation or elimination of this compound in such a reservoir or lake is significant , ranging from 1.2 % to 11 % of the total amount emitted. The projected amount of dissolved BENZOANTHRACENE in a reservoir or lake characterized by a retention time of 365 days is low, ranging from 1.2 % to 11 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is high. Concentration in the sediment may be 106750.0 times as great as ambient water concentration. Based on the analysis performed, between 80 % and 98 % of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant BENZOANTHRACENE loads is high. Based on the analysis performed, approximately .038 % of the amount emitted will be taken up by fish. Concentrations of BENZOANTHRACENE in fish may be 9855.4 times as great as dissolved concentrations. Virtually no releases from the reservoirs or lakes to the atmosphere should occur.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- BENZOANTHRACENE -----

Parameter	Value	Referen
Solubility (mg/l)	.011	1
Ratio of molecular weights of BENZOANTHRACENE to oxygen	7.1	2
Octanol/Water Partition Coefficient	430000	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	n.a.	
Microbial degradation rate constant (/days)	.0030	4
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	.0030	

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicate a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of BENZOANTHRACENE

----- BENZOANTHRACENE -----

Parameter	Value	Referen
Solubility (mg/l)	.011	1
Ratio of molecular weights of BENZOANTHRACENE to oxygen	7.1	2
Octanol/Water Partition Coefficient	430000	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	n.a.	
Microbial degradation rate constant (/days)	.0030	4
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	.0030	

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicate a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of BENZOANTHRACENE

1 Weast, R. C., Ed., CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-144.

2 Davis, W. W. et. al., 1942, "Solublitiy of Carcinogenic and Related Hydrocarbons in Water," Jour. Am. Chem. Soc., 64:108.

3 EPA, 1976, The Environmental Fate of Selected Polynuclear Aromatic Hydrocarbons, U.S. Environmental Protection Agency, Washington, DC.

4 Pacific Northwest Laboratories, Control of Genetically Active Chemicals in the Aquatic Environment, prepared for Hats Task Force, EPA Contract No. 68-01-2200, Richland, Washington (1973).

BENZENE

THE POTENTIAL RELEASE RATES OF BENZENE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF BENZENE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF BENZENE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

BENZENE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 4.4 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 18 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 65 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO BENZENE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF BENZENE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH PEFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF BENZENE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 4.9 % AND 45 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, RANGING FROM 55 % TO 95 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED BENZENE IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 4.8 % TO 45 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING BENZENE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 33.8 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .064 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING BENZENE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000081 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF BENZENE IN FISH MAY BE 23.4 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED

IN 5 DAYS (50 TO 250 MILES) IS HIGH RANGING FROM 49 % TO 92 %.

MOVEMENT OF BENZENE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 15 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS HIGH RANGING FROM 78 % TO 84 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED BENZENE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 15 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .13 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 33.8 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING BENZENE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000068 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF BENZENE IN FISH MAY BE 23.4 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 43 % TO 58 %.

MOVEMENT OF BENZENE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 3.7 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , WITH APPROXIMATELY 93 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED BENZENE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 93 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 33.8 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .13 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT BENZENE LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000034 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF BENZENE IN FISH MAY BE 23.4 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS SIGNIFICANT, RANGING FROM 57 % TO 74 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- BENZENE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	1800	1
RATIO OF MOLECULAR WEIGHTS OF BENZENE TO OXYGEN	2.4	2
OCTANOL/WATER PARTITION COEFFICIENT	140	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	.017	4
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.017	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF BENZENE

THE FOLLOWING TABLE PROVIDES EXAMPLES OF ACTUAL DATA, FROM CHEMICAL ANALYSIS, LISTED IN EPA'S DISTRIBUTION REGISTER OF ORGANIC POLLUTANTS IN WATER (WATER DROP) AS DESCRIBED BY GARRISON ET. AL. (1979). DATA ARE LISTED FOR ONLY THE CATEGORIES RAW DRINKING WATER, FINISHED DRINKING WATER, SURFACE WATER AND WELL WATER.

REPORTED OBSERVATIONS OF
BENZENE
IN MAJOR MEDIA CATEGORIES

SAMPLE DESCRIPTION	MAXIMUM CONCENTRATION REPORTED, (UG/L)	REFERENCE
DRINKING WATER, FINISHED	6	1
SURFACE WATER	7	2

1. MONITORING TO DETECT PREVIOUSLY UNRECOGNIZED POLLUTANTS IN SURFACE WATERS, OFFICE OF TOXIC SUBSTANCES, U.S. ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. 20460, EPA-560/6-77-015, JULY 1977, 375 PP, NTIS

2. MONITORING TO DETECT PREVIOUSLY UNRECOGNIZED POLLUTANTS IN SURFACE WATERS, OFFICE OF TOXIC SUBSTANCES, U.S. ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. 20460,EPA-560/6-77-015,JULY 1977, 375 PP, NTIS

1 Weast, R. C., Ed., CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla. (1979), p. C-146.

2 Kenaga, E. E. and C. A. I. Goring, "Relationship Between Water Solubility, Soil Sorption, Octanol-Water Partitioning, and Bioconcentration of Chemicals in Biota," ASTM Third Aquatic Toxicology Symposium, New Orleans, October 17 and 18, 1978.

3 Kenaga, E. E. and C. A. I. Goring, "Relationship Between Water Solubility, Soil Sorption, Octanol-Water Partitioning, and Bioconcentration of Chemicals in Biota," ASTM Third Aquatic Toxicology Symposium, New Orleans, October 17 and 18, 1978.

4 Criteria Document prepared for Priority Pollutants per Section 307 of the Federal Water Pollution Control Act and the Clean Water Act as amended under contract for the U. S. Environmental Protection Agency.

BENZO(A)PYRENE

THE POTENTIAL RELEASE RATES OF BENZO(A)PYRENE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF BENZO(A)PYRENE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF BENZO(A)PYRENE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

BENZO(A)PYRENE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM .00055 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO .0022 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND .0080 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO BENZO(A)PYRENE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF BENZO(A)PYRENE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF BENZO(A)PYRENE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE WIDESPREAD. BASED ON THE ANALYSIS PERFORMED, BETWEEN 81 % AND 98 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 1.9 % TO 19 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED BENZO(A)PYRENE IN A RIVER REACH TRAVERSED IN 5 DAYS IS LOW, RANGING FROM .71 % TO 6.4 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING BENZO(A)PYRENE IS HIGH. CONCENTRATION IN THE SEDIMENT MAY BE 275000.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, BETWEEN 74 % AND 97 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING BENZO(A)PYRENE IS HIGH. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0072 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF BENZO(A)PYRENE IN FISH MAY BE 20040.0 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM

THE RIVERS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF BENZO(A)PYRENE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .32 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS SIGNIFICANT RANGING FROM 3.4 % TO 17 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED BENZO(A)PYRENE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY .062 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS HIGH, BASED ON THE ANALYSIS PERFORMED, BETWEEN 82 % AND 97 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 275000.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING BENZO(A)PYRENE IS HIGH. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0012 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF BENZO(A)PYRENE IN FISH MAY BE 20040.0 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE PONDS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF BENZO(A)PYRENE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .020 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS SIGNIFICANT , RANGING FROM 1.7 % TO 12 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED BENZO(A)PYRENE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 1.7 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS HIGH. CONCENTRATION IN THE SEDIMENT MAY BE 275000.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, BETWEEN 87 % AND 98 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT BENZO(A)PYRENE LOADS IS HIGH. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00051 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF BENZO(A)PYRENE IN FISH MAY BE 20040.0 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RESERVOIRS OR LAKES TO THE ATMOSPHERE SHOULD OCCUR.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- BENZO(A)PYRENE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	.012	1
RATIO OF MOLECULAR WEIGHTS OF BENZO(A)PYRENE TO OXYGEN	7.9	2
OCTANOL/WATER PARTITION COEFFICIENT	1100000	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	.064	4
PHOTOLYSIS RATE CONSTANT (/DAYS)	.48	5
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.54	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF BENZO(A)PYRENE

THE FOLLOWING TABLE PROVIDES EXAMPLES OF ACTUAL DATA, FROM CHEMICAL ANALYSIS, LISTED IN EPA'S DISTRIBUTION REGISTER OF ORGANIC POLLUTANTS IN WATER (WATER DROP) AS DESCRIBED BY GARRISON ET. AL. (1979). DATA ARE LISTED FOR ONLY THE CATEGORIES RAW DRINKING WATER, FINISHED DRINKING WATER, SURFACE WATER AND WELL WATER.

REPORTED OBSERVATIONS OF
BENZO(A)PYRENE
IN MAJOR MEDIA CATEGORIES

SAMPLE DESCRIPTION	MAXIMUM CONCENTRATION REPORTED, (UG/L)	REFERENCE
SURFACE WATER	0.16	1

1. PERSONAL COMMUNICATION: J.M. SYMONS (EPA, MERL, CINCINNATI, OH) TO F. GREEN, OCTOBER 29,1974; SUBJECT: POLYNUCLEAR AROMATIC HYDROCARBONS IN RHINE RIVER AT LOBITH IN 1973.

1 Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-203.

2 Wilk, M. and H. Schwab. 1968. "Firm Transport Phanomen und Wirkungs Mechismo Des 3,4-Benzpyrens in Der Zelle.," Z. Naturforsch 23 B-431.

3 EPA, 1976, The Environmental Fate of Selected Polynuclear Aromatic Hydrocarbons, U.S. Environmental Protection Agency, Washington, DC.

4 Pacific Northwest Laboratories, Control of Genetically Active Chemicals in the Aquatic Environment, prepared for Hats Task Force, EPA Contract No. 68-01-2200, Richland, Washington (1973).

5 Faust, S. D., and Hunter, J. V., Organic Compounds in Aquatic Environment, Marcel Dekker, New York, 1971.

BENZOTRICHLORIDE

THE POTENTIAL RELEASE RATES OF BENZOTRICHLORIDE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF BENZOTRICHLORIDE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF BENZOTRICHLORIDE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

BENZOTRICHLORIDE WAS FOUND TO BE THE MAJOR CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE APPROXIMATELY .00 MG PER SQUARE METER OF SURFACE AREA PER YEAR! FOR LANDFILLS AND .00 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LAGOONS. APPROXIMATELY .00 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY .00 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS. BENZOTRICHLORIDE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE APPROXIMATELY .00 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND .00 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY .00 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY .00 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO BENZOTRICHLORIDE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF

RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF BENZOTRICHLORIDE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF BENZOTRICHLORIDE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, WITH APPROXIMATELY 100 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED BENZOTRICHLORIDE IN A RIVER REACH TRAVERSED IN 5 DAYS IS LOW, WITH APPROXIMATELY .00 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING BENZOTRICHLORIDE IS HIGH. CONCENTRATION IN THE

SEDIMENT MAY BE 2678.8 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING BENZOTRICHLORIDE IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000026% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF BENZOTRICHLORIDE IN FISH MAY BE 621.4 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RIVERS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF BENZOTRICHLORIDE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00019 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS HIGH RANGING FROM 44 % TO 91 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED BENZOTRICHLORIDE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY .00019 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS HIGH. BASED ON THE ANALYSIS PERFORMED, BETWEEN 9.0 % AND 56 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 2678.8 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING BENZOTRICHLORIDE IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000004% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF BENZOTRICHLORIDE IN FISH MAY BE 621.4 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE PONDS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF BENZOTRICHLORIDE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000050 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF

365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , RANGING FROM 43 % TO 90 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED BENZOTRICHLORIDE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 43 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS HIGH. CONCENTRATION IN THE SEDIMENT MAY BE 2678.8 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, BETWEEN 9.6 % AND 57 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT BENZOTRICHLORIDE LOADS IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000002% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF BENZOTRICHLORIDE IN FISH MAY BE 621.4 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RESERVOIRS OR LAKES TO THE ATMOSPHERE SHOULD OCCUR.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- BENZOTRICHLORIDE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	5.9	1
RATIO OF MOLECULAR WEIGHTS OF BENZOTRICHLORIDE TO OXYGEN	6.1	2
OCTANOL/WATER PARTITION COEFFICIENT	11000	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	2400	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	2400	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF BENZOTRICHLORIDE

1 Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-528.

2 Chiou, C. T., U. H. Freed, D. W. Schmedding, and R. L. Kohnert, 1977, Partition Coefficients and Bioaccumulation of Selected Organic Chemicals, Env. Sci. Technol., 11:475-478.

3 Values of Kow were calculated using a computer routine developed at SRI by Johnson and Leibrand (1980) which uses group values reported by Hansch and Leo (1979).

BENZYLCHLORIDE

THE POTENTIAL RELEASE RATES OF BENZYLCHLORIDE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF BENZYLCHLORIDE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF BENZYLCHLORIDE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT I.

BENZYLCHLORIDE WAS FOUND TO BE THE MAJOR CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE APPROXIMATELY .00 MG PER SQUARE METER OF SURFACE AREA PER YEAR! FOR LANDFILLS AND .00 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LAGOONS. APPROXIMATELY .00 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY .00 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO BENZYLCHLORIDE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF BENZYLCHLORIDE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT I.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF BENZYLCHLORIDE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .25 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, WITH APPROXIMATELY 100 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED BENZYLCHLORIDE IN A RIVER REACH TRAVERSED IN 5 DAYS IS LOW, WITH APPROXIMATELY .25 % OF THE TOTAL AMOUNT EMITTED.

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THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING BENZYLCHLORIDE IS SIGNIFICANT. CONCENTRATION IN THE SEDIMENT MAY BE 106.8 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0011 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING BENZYLCHLORIDE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000046 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF BENZYLCHLORIDE IN FISH MAY BE 55.4 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM

THE RIVERS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF BENZYLCHLORIDE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .79 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS HIGH WITH APPROXIMATELY94 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED BENZYLCHLORIDE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY .79 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .40 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 106.8 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING BENZYLCHLORIDE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000087 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF BENZYLCHLORIDE IN FISH MAY BE 55.4 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE PONDS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF BENZYLCHLORIDE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .22 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , WITH APPROXIMATELY 95 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED BENZYLCHLORIDE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 95 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS SIGNIFICANT. CONCENTRATION IN THE SEDIMENT MAY BE 106.8 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .42 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT BENZYLCHLORIDE LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPPROXIMATELY .0000050 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF BENZYLCHLORIDE IN FISH MAY BE 55.4 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RESERVOIRS OR LAKES TO THE ATMOSPHERE SHOULD OCCUR.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- BENZYLCHLORIDE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	330000	1
RATIO OF MOLECULAR WEIGHTS OF BENZYLCHLORIDE TO OXYGEN	4.0	2
OCTANOL/WATER PARTITION COEFFICIENT	430	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	1.2	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	1.2	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF BENZYLCHLORIDE

1 Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-522.

2 Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by the U.S. Environmental Protection Agency.

3 Values of Kow were calculated using a computer routine developed at SRI by Johnson and Leibrand (1980) which uses group values reported by Hansch and Leo (1979).

CADMIUM

THE POTENTIAL RELEASE RATES OF CADMIUM FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF CADMIUM THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF CADMIUM CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

CADMIUM WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 600 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 2400 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 8800 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO CADMIUM THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF CADMIUM THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1. BECAUSE NO

DEGRADATION DATA WERE AVAILABLE, THE RESULTS OF THE ANALYSIS SUBSEQUENTLY PRESENTED PROVIDES ESTIMATES OF THE RELATIVE PARTITIONING ONLY BETWEEN AIR, WATER, AND SEDIMENT MEDIA.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF CADMIUM DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 8.4 % AND 56 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE PROJECTED AMOUNT OF DISSOLVED CADMIUM IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 8.4 % TO 56 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING CADMIUM IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00058 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING CADMIUM IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000022 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH.

CONCENTRATIONS OF CADMIUM IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS HIGH RANGING FROM 44 % TO 92 %.

MOVEMENT OF CADMIUM THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 24 % AND 36 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE PROJECTED AMOUNT OF DISSOLVED CADMIUM IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 24 % TO 36 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00096 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING CADMIUM IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000027 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF CADMIUM IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 64 % TO 76 %.

MOVEMENT OF CADMIUM THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 5.6 % AND 11 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE PROJECTED AMOUNT OF DISSOLVED CADMIUM IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS SIGNIFICANT, RANGING FROM 89 % TO 94 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0010 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT CADMIUM LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000013 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF CADMIUM IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS HIGH, RANGING FROM 89 % TO 94 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- CADMIUM -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	20	1
RATIO OF MOLECULAR WEIGHTS OF CADMIUM TO OXYGEN	3.5	2
OCTANOL/WATER PARTITION COEFFICIENT	1.0	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATES A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF CADMIUM

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1 Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. B-103.

2 Criteria Document, Cadmium.

3 Best Judgement by J. W. Falco, EPA-ERL, Athens, Georgia.

CARBON TETRACHLORIDE

THE POTENTIAL RELEASE RATES OF CARBON TETRACHLORIDE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF CARBON TETRACHLORIDE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF CARBON TETRACHLORIDE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

CARBON TETRACHLORIDE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 1.4 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 5.5 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 20 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO CARBON TETRACHLORIDE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF CARBON TETRACHLORIDE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF

ATTACHMENT 1.

THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. BECAUSE NO DEGRADATION DATA WERE AVAILABLE, THE RESULTS OF THE ANALYSIS SUBSEQUENTLY PRESENTED PROVIDES ESTIMATES OF THE RELATIVE PARTITIONING ONLY BETWEEN AIR, WATER, AND SEDIMENT MEDIA.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF CARBON TETRACHLORIDE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 13 % AND 61 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE PROJECTED AMOUNT OF DISSOLVED CARBON TETRACHLORIDE IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 13 % TO 60 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING CARBON TETRACHLORIDE IS SIGNIFICANT. CONCENTRATION IN THE SEDIMENT MAY BE 109.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .28 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING CARBON TETRACHLORIDE IS LOW. BASED ON THE

ANALYSIS PERFORMED, APPROXIMATELY .00022 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF CARBON TETRACHLORIDE IN FISH MAY BE 56.3 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS HIGH RANGING FROM 39 % TO 87 %.

MOVEMENT OF CARBON TETRACHLORIDE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 27 % AND 38 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE PROJECTED AMOUNT OF DISSOLVED CARBON TETRACHLORIDE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 27 % TO 38 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .42 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 109.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING CARBON TETRACHLORIDE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00029 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF CARBON TETRACHLORIDE IN FISH MAY BE 56.3 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 57 % TO 73 %.

MOVEMENT OF CARBON TETRACHLORIDE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 6.5 % AND 12 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE PROJECTED AMOUNT OF DISSOLVED CARBON TETRACHLORIDE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS SIGNIFICANT, RANGING FROM 83 % TO 93 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS SIGNIFICANT. CONCENTRATION IN THE SEDIMENT MAY BE 109.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .43 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT CARBON TETRACHLORIDE LOADS IS LOW, BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00015 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF CARBON TETRACHLORIDE IN FISH MAY BE 56.3 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS HIGH, RANGING FROM 83 % TO 93 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- CARBON TETRACHLORIDE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	800	1
RATIO OF MOLECULAR WEIGHTS OF CARBON TETRACHLORIDE TO OXYGEN	4.8	2
OCTANOL/WATER PARTITION COEFFICIENT	440	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	.00	4
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATES A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF CARBON TETRACHLORIDE

THE FOLLOWING TABLE PROVIDES EXAMPLES OF ACTUAL DATA, FROM CHEMICAL ANALYSIS, LISTED IN EPA'S DISTRIBUTION REGISTER OF ORGANIC POLLUTANTS IN WATER (WATER DROP) AS DESCRIBED BY GARRISON ET, AL, (1979). DATA ARE LISTED FOR ONLY THE CATEGORIES RAW DRINKING WATER, FINISHED DRINKING WATER, SURFACE WATER AND WELL WATER.

REPORTED OBSERVATIONS OF

CARBON TETRACHLORIDE

IN MAJOR MEDIA CATEGORIES

SAMPLE DESCRIPTION	MAXIMUM CONCENTRATION REPORTED, (UG/L)	REFERENCE
DRINKING WATER, FINISHED	3	1
SURFACE WATER	3	2

1. MONITORING TO DETECT PREVIOUSLY UNRECOGNIZED POLLUTANTS IN SURFACE WATERS, OFFICE OF TOXIC SUBSTANCES, U.S. ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. 20460,EPA-560/6-77-015,JULY 1977, 375 PP, NTIS

2. MONITORING TO DETECT PREVIOUSLY UNRECOGNIZED POLLUTANTS IN SURFACE WATERS, OFFICE OF TOXIC SUBSTANCES, U.S. ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. 20460,EPA-560/6-77-015,JULY 1977, 375 PP, NTIS

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Kenaga, E. E., and C. A. I. Goring, "Relationship Between Water Solubility, Soil Sorption, Octanol-Water Partitioning, and Bioconcentration of Chemicals in Biota," ASTM Third Aquatic Toxicology Symposium, New Orleans, Oct. 17 and 18, 1978.

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1X6

CHLORAL

THE POTENTIAL RELEASE RATES OF CHLORAL FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF CHLORAL THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF CHLORAL CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

CHLORAL WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 23 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 93 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 340 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO CHLORAL THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF CHLORAL THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF CHLORAL DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE WIDESPREAD. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 89 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 11 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED CHLORAL IN A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, WITH APPROXIMATELY 88 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING CHLORAL IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 6.4 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .024 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING CHLORAL IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000032 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF CHLORAL IN FISH MAY BE 6.7 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RIVERS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF CHLORAL THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 29 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS SIGNIFICANT WITH APPROXIMATELY70 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED CHLORAL IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 29 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .025 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 6.4 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING CHLORAL IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000038 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF CHLORAL IN FISH MAY BE 6.7 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE PONDS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF CHLORAL THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 10 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , WITH APPROXIMATELY 69 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED CHLORAL IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 89 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 6.4 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE

ANALYSIS PERFORMED, APPROXIMATELY .026 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT CHLORAL LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000028 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF CHLORAL IN FISH MAY BE 6.7 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RESERVOIRS OR LAKES TO THE ATMOSPHERE SHOULD OCCUR.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

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-----      CHLORAL -----

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PARAMETER                                    VALUE     REFEREN
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SOLUBILITY (MG/L)                            15000        1

RATIO OF MOLECULAR WEIGHTS OF                  4.6        2
  CHLORAL TO OXYGEN

OCTANOL/WATER PARTITION COEFFICIENT          26           3

ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)      N.A.

ACID HYDROLYSIS RATE CONSTANT (/DAYS)          N.A.

HYDROLYSIS RATE CONSTANT (/DAYS)               N.A.

MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)    .024       4

PHOTOLYSIS RATE CONSTANT (/DAYS)               N.A.

OXIDATION RATE CONSTANT (/DAYS)                N.A.

OVERALL DEGRADATION RATE CONSTANT (/DAYS)      .024

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IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'


OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED
CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND
MICROBIAL DEGRADATION PROCESSES. IN SOME CASES
DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO
ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS.
IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS
CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE
FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A.
DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS
RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE
OF  CHLORAL
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2 Chiou, C. T., U. H. Freed, D. W. Schmedding, and R. L. Kohnert, 1977, "Partition Coefficients and Bioaccumulation of Selected Organic Chemicals," Env. Sci. Technol., 11:475-78.

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4 Mabey, W. R., Hill, T., Hendry, D. G., Chou, T., Johnson, H. L., Best Judgement. SRI International.

CHLOROACETALDEHYDE

THE POTENTIAL RELEASE RATES OF CHLOROACETALDEHYDE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF CHLOROACETALDEHYDE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF CHLOROACETALDEHYDE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT I.

CHLOROACETALDEHYDE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 300 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 1200 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 4400 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO CHLOROACETALDEHYDE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF CHLOROACETALDEHYDE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF

THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT I.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF CHLOROACETALDEHYDE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE WIDESPREAD. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 89 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 11 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED CHLOROACETALDEHYDE IN A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, WITH APPROXIMATELY 89 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING CHLOROACETALDEHYDE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.5 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0019 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING CHLOROACETALDEHYDE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000047 % OF THE

AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF CHLOROACETALDEHYDE IN FISH MAY BE 1.0 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RIVERS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF CHLOROACETALDEHYDE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 29 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS SIGNIFICANT WITH APPROXIMATELY71 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED CHLOROACETALDEHYDE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 29 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0019 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 0.5 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING CHLOROACETALDEHYDE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000055 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF CHLOROACETALDEHYDE IN FISH MAY BE 1.0 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE PONDS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF CHLOROACETALDEHYDE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 10 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , WITH APPROXIMATELY 90 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED CHLOROACETALDEHYDE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 90 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.5 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0020 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT CHLOROACETALDEHYDE LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000041 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF CHLOROACETALDEHYDE IN FISH MAY BE 1.0 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RESERVOIRS OR LAKES TO THE ATMOSPHERE SHOULD OCCUR.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

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-----       CHLOROACETALDEHYDE -----

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PARAMETER                                        VALUE     REFEREN
-----------------------------------------------------------------

SOLUBILITY (MG/L)                               10000         1

RATIO OF MOLECULAR WEIGHTS OF                     2.5         2
  CHLOROACETALDEHYDE TO OXYGEN

OCTANOL/WATER PARTITION COEFFICIENT            2.0            3

ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)         N.A.

ACID HYDROLYSIS RATE CONSTANT (/DAYS)             N.A.

HYDROLYSIS RATE CONSTANT (/DAYS)                  N.A.

MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)       .024        4

PHOTOLYSIS RATE CONSTANT (/DAYS)                  N.A.

OXIDATION RATE CONSTANT (/DAYS)                   N.A.

OVERALL DEGRADATION RATE CONSTANT (/DAYS)         .024

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IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'


OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED
CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND
MICROBIAL DEGRADATION PROCESSES. IN SOME CASES
DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO
ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS.
IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS
CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE
FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A.
DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS
RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE
OF  CHLOROACETALDEHYDE
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1 Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-82.

2 Dawson, G. W., English, C. J., Petty, S. E., Best Estimate by Battelle Northwest.

3 Values of Kow were calculated using a computer routine developed at SRI by Johnson and Leibrand (1980) which uses group values reported by Hansch and Leo (1979).

4 Mabey, W. R., Mill, T., Hendry, D. G., Chou, T., Johnson, H. L., Best Judgement. SRI International.

CHLOROBENZENE

THE POTENTIAL RELEASE RATES OF CHLOROBENZENE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF CHLOROBENZENE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF CHLOROBENZENE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

CHLOROBENZENE WAS FOUND TO BE THE MAJOR CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 73000 MG PER SQUARE METER OF SURFACE AREA PER YEAR TO 290000 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LANDFILLS AND .00 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS. CHLOROBENZENE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM .87 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 3.5 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 13 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO CHLOROBENZENE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF

RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF CHLOROBENZENE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF CHLOROBENZENE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 10 % AND 55 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, RANGING FROM 45 % TO 90 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED CHLOROBENZENE IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 9.3 % TO 55 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING CHLOROBENZENE IS SIGNIFICANT. CONCENTRATION IN THE SEDIMENT MAY BE 172.5 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .40 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING CHLOROBENZENE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00030 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF CHLOROBENZENE IN FISH MAY BE 79.4 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS HIGH RANGING FROM 44 % TO 89 %.

MOVEMENT OF CHLOROBENZENE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 22 % AND 30 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS SIGNIFICANT RANGING FROM 62 % TO 77 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED CHLOROBENZENE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 22 % TO 30 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN .66 % AND 7.8 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 172.5 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING CHLOROBENZENE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00034 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF CHLOROBENZENE IN FISH MAY BE 79.4 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 53 % TO 70 %.

MOVEMENT OF CHLOROBENZENE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 5.3 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , RANGING FROM 83 % TO 94 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED CHLOROBENZENE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 83 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS SIGNIFICANT. CONCENTRATION IN THE SEDIMENT MAY BE 172.5 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, BETWEEN .69 % AND 7.9 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT CHLOROBENZENE LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00017 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF CHLOROBENZENE IN FISH MAY BE 79.4 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS HIGH, RANGING FROM 74 % TO 88 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- CHLOROBENZENE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	490	1
RATIO OF MOLECULAR WEIGHTS OF CHLOROBENZENE TO OXYGEN	3.5	2
OCTANOL/WATER PARTITION COEFFICIENT	690	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	.0030	4
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.0030	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF CHLOROBENZENE

THE FOLLOWING TABLE PROVIDES EXAMPLES OF ACTUAL DATA, FROM CHEMICAL ANALYSIS, LISTED IN EPA'S DISTRIBUTION REGISTER OF ORGANIC POLLUTANTS IN WATER (WATER DROP) AS DESCRIBED BY GARRISON ET. AL. (1979). DATA ARE LISTED FOR ONLY THE CATEGORIES RAW DRINKING WATER, FINISHED DRINKING WATER, SURFACE WATER AND WELL WATER.

REPORTED OBSERVATIONS OF
CHLOROBENZENE
IN MAJOR MEDIA CATEGORIES

SAMPLE DESCRIPTION	MAXIMUM CONCENTRATION REPORTED, (UG/L)	REFERENCE
DRINKING WATER, FINISHED	4	1
SURFACE WATER	1	2
WELL WATER	30	3

1. MONITORING TO DETECT PREVIOUSLY UNRECOGNIZED POLLUTANTS IN SURFACE WATERS, OFFICE OF TOXIC SUBSTANCES, U.S. ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. 20460,EPA-560/6-77-015,JULY 1977, 375 PP, NTIS
2. MONITORING TO DETECT PREVIOUSLY UNRECOGNIZED POLLUTANTS IN SURFACE WATERS, OFFICE OF TOXIC SUBSTANCES, U.S. ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. 20460,EPA-560/6-77-015,JULY 1977, 375 PP, NTIS
3. ENVIRONMENTAL APPLICATIONS OF ADVANCED INSTRUMENTAL ANALYSIS: ASSISTANCE PROJECTS FY 1974 EPA-660/4-75-004

1 Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-153.

2 Criteria Document prepared for Priority Pollutants per Section 307 of the Federal Water Pollution Control Act and the Clean Water Act as amended under contract for the U.S. Environmental Protection Agency.

3 Kenaga, E. E., and C. A. I. Goring, "Relationship Between Water Solubility, Soil Sorption, Octanol-Water Partitioning, and Bioconcentration of Chemicals in Biota," ASTM Third Aquatic Toxicology Symposium, New Orleans, Oct. 17 and 18, 1978.

4 Metcalf, R. L. and P. Lu, Environmental Distribution and Metabolic Fate of Key Industrial Pollutants and Pesticides in A Model Ecosystem, University of Illinois, Urbana-Campaign, (1973).

CHLORDANE

THE POTENTIAL RELEASE RATES OF CHLORDANE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF CHLORDANE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF CHLORDANE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

CHLORDANE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM .015 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO .060 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND .22 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO CHLORDANE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF CHLORDANE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF CHLORDANE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE WIDESPREAD. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 96 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS LOW, WITH APPROXIMATELY 1.0 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED CHLORDANE IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 17 % TO 68 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING CHLORDANE IS HIGH. CONCENTRATION IN THE SEDIMENT MAY BE 10000.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, BETWEEN 28 % AND 83 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING CHLORDANE IS HIGH. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0058 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF CHLORDANE IN FISH MAY BE 1668.8 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RIVERS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF CHLORDANE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 9.4 % AND 34 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS SIGNIFICANT RANGING FROM 9.8 % TO 39 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED CHLORDANE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 8.2 % TO 33 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS HIGH. BASED ON THE ANALYSIS PERFORMED, BETWEEN 28 % AND 82 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 10000.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING CHLORDANE IS HIGH. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .010 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF CHLORDANE IN FISH MAY BE 1668.8 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE PONDS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF CHLORDANE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 3.4 % AND 14 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS SIGNIFICANT , RANGING FROM 14 % TO 58 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED CHLORDANE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS SIGNIFICANT, RANGING FROM 14 % TO 58 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS HIGH. CONCENTRATION IN THE SEDIMENT MAY BE 10000.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, BETWEEN 28 % AND 83 % OF THE

AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT CHLORDANE LOADS IS HIGH. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0089 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF CHLORDANE IN FISH MAY BE 1668.8 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RESERVOIRS OR LAKES TO THE ATMOSPHERE SHOULD OCCUR.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- CHLORDANE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	.0090	1
RATIO OF MOLECULAR WEIGHTS OF CHLORDANE TO OXYGEN	13	2
OCTANOL/WATER PARTITION COEFFICIENT	40000	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	.012	4
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.012	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF CHLORDANE

THE FOLLOWING TABLE PROVIDES EXAMPLES OF ACTUAL DATA, FROM CHEMICAL ANALYSIS, LISTED IN EPA'S DISTRIBUTION REGISTER OF ORGANIC POLLUTANTS IN WATER (WATER DROP) AS DESCRIBED BY GARRISON ET. AL. (1979). DATA ARE LISTED FOR ONLY THE CATEGORIES RAW DRINKING WATER, FINISHED DRINKING WATER, SURFACE WATER AND WELL WATER.

REPORTED OBSERVATIONS OF
CHLORDANE
IN MAJOR MEDIA CATEGORIES

SAMPLE DESCRIPTION	MAXIMUM CONCENTRATION REPORTED, (UG/L)	REFERENCE
SURFACE WATER	0.8	1

1. PESTICIDE MONITORING JOURNAL 8,33 (1974)

741

1 Chemical Week Pesticides Register.

2 Brooks, G. T., 1974. Chlorinated Insecticides, CRC Press, Cleveland, Ohio.

3 Values of Kow were calculated using a computer routine developed at SRI by Johnson and Leibrand (1980) which uses group values reported by Hansch and Leo (1979).

4 Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by the U.S. Environmental Protection Agency.

BIS CHLOROEHTYL ETHER

THE POTENTIAL RELEASE RATES OF BIS CHLOROEHTYL ETHER FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF BIS CHLOROEHTYL ETHER THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF BIS CHLOROEHTYL ETHER CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A.~~ ATTACHMENT 1.

BIS CHLOROEHTYL ETHER WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 600 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 2400 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 8800 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO BIS CHLOROEHTYL ETHER THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF BIS CHLOROEHTYL ETHER THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF

THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT I. BECAUSE NO DEGRADATION DATA WERE AVAILABLE, THE RESULTS OF THE ANALYSIS SUBSEQUENTLY PRESENTED PROVIDES ESTIMATES OF THE RELATIVE PARTITIONING ONLY BETWEEN AIR, WATER, AND SEDIMENT MEDIA.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF BIS CHLOROEHTYL ETHER DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 11 % AND 59 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE PROJECTED AMOUNT OF DISSOLVED BIS CHLOROEHTYL ETHER IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 11 % TO 59 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING BIS CHLOROEHTYL ETHER IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00062 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING BIS CHLOROEHTYL ETHER IS LOW. BASED ON THE

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ANALYSIS PERFORMED, APPROXIMATELY .0000023 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF BIS CHLOROEHTYL ETHER IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS HIGH RANGING FROM 41 % TO 89 %.

MOVEMENT OF BIS CHLOROEHTYL ETHER THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 26 % AND 39 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE PROJECTED AMOUNT OF DISSOLVED BIS CHLOROEHTYL ETHER IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 26 % TO 39 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00096 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING BIS CHLOROEHTYL ETHER IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000029 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF BIS CHLOROEHTYL ETHER IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 61 % TO 74 %.

MOVEMENT OF BIS CHLOROEHTYL ETHER THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 6.3 % AND 12 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE PROJECTED AMOUNT OF DISSOLVED BIS CHLOROEHTYL ETHER IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS SIGNIFICANT, RANGING FROM 88 % TO 94 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0010 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT BIS CHLOROEHTYL ETHER LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000015 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF BIS CHLOROEHTYL ETHER IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS HIGH, RANGING FROM 88 % TO 94 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- BIS CHLOROEHTYL ETHER -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	10000	1
RATIO OF MOLECULAR WEIGHTS OF BIS CHLOROEHTYL ETHER TO OXYGEN	4.5	2
OCTANOL/WATER PARTITION COEFFICIENT	1.0	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATES A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF BIS CHLOROEHTYL ETHER

THE FOLLOWING TABLE PROVIDES EXAMPLES OF ACTUAL DATA, FROM CHEMICAL ANALYSIS, LISTED IN EPA'S DISTRIBUTION REGISTER OF ORGANIC POLLUTANTS IN WATER (WATER DROP) AS DESCRIBED BY GARRISON ET. AL. (1979). DATA ARE LISTED FOR ONLY THE CATEGORIES RAW DRINKING WATER, FINISHED DRINKING WATER, SURFACE WATER AND WELL WATER.

REPORTED OBSERVATIONS OF
BIS CHLOROETHYL ETHER
IN MAJOR MEDIA CATEGORIES

SAMPLE DESCRIPTION	MAXIMUM CONCENTRATION REPORTED, (UG/L)	REFERENCE
DRINKING WATER, FINISHED	0.16	1

1. ANALYTICAL REPORT: NEW ORLEANS AREA WATER SUPPLY STUDY; EPA 906/9-75-003 UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, REGION VI, DALLAS, TX, DEC.9, 1975, 95 PAGES, NTIS

1 EPA, 1980, "Bis(chloromethyl) Ether: Hazard Profile," Center for Chemical Hazard Assessment, Profile Developed for Priority Pollutants (EPA).

2 Verschueren, Karel, 1977, Handbook of Environ. Data on Organic Chemicals, Van Nostrand, NY.

3 Values of Kow were calculated using a computer routine developed at SRI by Johnson and Leibrand (1980) which uses group values reported by Hansch and Leo (1979).

CHLOROFORM

THE POTENTIAL RELEASE RATES OF CHLOROFORM FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF CHLOROFORM THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF CHLOROFORM CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

CHLOROFORM WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 6.0 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 24 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 88 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO CHLOROFORM THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF CHLOROFORM THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF CHLOROFORM DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 9.2 % AND 56 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, RANGING FROM 44 % TO 91 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED CHLOROFORM IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 9.1 % TO 56 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING CHLOROFORM IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 25.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .059 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING CHLOROFORM IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000071 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF CHLOROFORM IN FISH MAY BE 18.7 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH

TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS HIGH RANGING FROM 43 % TO 91 %.

MOVEMENT OF CHLOROFORM THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 24 % AND 34 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS SIGNIFICANT RANGING FROM 64 % TO 76 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED CHLOROFORM IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 24 % TO 34 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .096 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 25.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING CHLOROFORM IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000084 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF CHLOROFORM IN FISH MAY BE 18.7 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 59 % TO 73 %.

MOVEMENT OF CHLOROFORM THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 5.6 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , RANGING FROM 89 % TO 94 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED CHLOROFORM IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 89 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 25.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .10 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT CHLOROFORM LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000042 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF CHLOROFORM IN FISH MAY BE 18.7 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS HIGH, RANGING FROM 83 % TO 91 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- CHLOROFORM -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	8200	1
RATIO OF MOLECULAR WEIGHTS OF CHLOROFORM TO OXYGEN	3.7	2
OCTANOL/WATER PARTITION COEFFICIENT	100	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	.0015	4
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.0015	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF CHLOROFORM

THE FOLLOWING TABLE PROVIDES EXAMPLES OF ACTUAL DATA, FROM CHEMICAL ANALYSIS, LISTED IN EPA'S DISTRIBUTION REGISTER OF ORGANIC POLLUTANTS IN WATER (WATER DROP) AS DESCRIBED BY GARRISON ET. AL. (1979). DATA ARE LISTED FOR ONLY THE CATEGORIES RAW DRINKING WATER, FINISHED DRINKING WATER, SURFACE WATER AND WELL WATER.

REPORTED OBSERVATIONS OF

CHLOROFORM

IN MAJOR MEDIA CATEGORIES

SAMPLE DESCRIPTION	MAXIMUM CONCENTRATION REPORTED, (UG/L)	REFERENCE
DRINKING WATER, FINISHED	152	1
SURFACE WATER	120	2

1. JOURNAL OF THE AMERICAN WATER WORKS ASSOCIATION, 66,703 (1974)

2. MONITORING TO DETECT PREVIOUSLY UNRECOGNIZED POLLUTANTS IN SURFACE WATERS, OFFICE OF TOXIC SUBSTANCES, U.S. ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. 20460,EPA-560/6-77-015,JULY 1977, 375 PP, NTIS

1 Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. B-375.

2 Strier, M. P., "Pollutant Treatability: A Molecular Engineering Approach," Environmental Science and Technology, Vol. 14, No. 1, January 1980, pp. 28-31.

3 Strier, M. P., "Pollutant Treatability: A Molecular Engineering Approach," Environmental Science and Technology, Vol. 14, No. 1, January 1980, pp. 28-31.

4 Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by the U.S. Environmental Protection Agency.

2-CHLOROPHENOL

THE POTENTIAL RELEASE RATES OF 2-CHLOROPHENOL FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF 2-CHLOROPHENOL THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF 2-CHLOROPHENOL CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

2-CHLOROPHENOL WAS FOUND TO BE THE MAJOR CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 4300000 MG PER SQUARE METER OF SURFACE AREA PER YEAR TO 17000000 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LANDFILLS AND .00 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS. 2-CHLOROPHENOL WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 4.2 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 17 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 61 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO 2-CHLOROPHENOL THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF

RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF 2-CHLOROPHENOL THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF 2-CHLOROPHENOL DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 79 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 21 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED 2-CHLOROPHENOL IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 78 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING 2-CHLOROPHENOL IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 36.1 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .12 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING 2-CHLOROPHENOL IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00011 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF 2-CHLOROPHENOL IN FISH MAY BE 24.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RIVERS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF 2-CHLOROPHENOL THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 17 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS HIGH WITH APPROXIMATELY81 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED 2-CHLOROPHENOL IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 17 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .14 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 36.1 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING 2-CHLOROPHENOL IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000080 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF 2-CHLOROPHENOL IN FISH MAY BE 24.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE PONDS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF 2-CHLOROPHENOL THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 5.3 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED

OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , WITH APPROXIMATELY 93 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED 2-CHLOROPHENOL IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 93 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 36.1 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .14 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT 2-CHLOROPHENOL LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000053 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF 2-CHLOROPHENOL IN FISH MAY BE 24.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RESERVOIRS OR LAKES TO THE ATMOSPHERE SHOULD OCCUR.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- . 2-CHLOROPHENOL -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	29000	1
RATIO OF MOLECULAR WEIGHTS OF 2-CHLOROPHENOL TO OXYGEN	4.0	2
OCTANOL/WATER PARTITION COEFFICIENT	140	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	.048	4
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.048	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF 2-CHLOROPHENOL

~~T61~~

1 Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-429.

2 Verschueren, Karel, 1977, Handbook of Environ. Data on Organic Chemicals, Van Nostrand, NY.

3 Compilation of solvent water partition coefficients as reported in the literature. Developed and maintained by Dr. Corlan Hansch, Pomona College, Pomona, California.

4 Verschueren, Karel, 1977, Handbook of Environ. Data on Organic Chemicals, Van Nostrand, N.Y.

N62

3-CHLOROPHENOL

THE POTENTIAL RELEASE RATES OF 3-CHLOROPHENOL FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF 3-CHLOROPHENOL THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF 3-CHLOROPHENOL CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX X~~. ATTACHMENT 1.

3-CHLOROPHENOL WAS FOUND TO BE THE MAJOR CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 3900000 MG PER SQUARE METER OF SURFACE AREA PER YEAR TO 16000000 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LANDFILLS AND .00 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS. 3-CHLOROPHENOL WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 1.9 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 7.6 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 28 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO 3-CHLOROPHENOL THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF

RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF 3-CHLOROPHENOL THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF 3-CHLOROPHENOL DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 8.5 % AND 46 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, RANGING FROM 54 % TO 91 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED 3-CHLOROPHENOL IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 8.2 % TO 45 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING 3-CHLOROPHENOL IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 79.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .15 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING 3-CHLOROPHENOL IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00015 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF 3-CHLOROPHENOL IN FISH MAY BE 44.2 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS HIGH RANGING FROM 38 % TO 83 %.

MOVEMENT OF 3-CHLOROPHENOL THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 11 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS HIGH WITH APPROXIMATELY83 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED 3-CHLOROPHENOL IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 11 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .30 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 79.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING 3-CHLOROPHENOL IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000096 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF 3-CHLOROPHENOL IN FISH MAY BE 44.2 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 21 % TO 34 %.

MOVEMENT OF 3-CHLOROPHENOL THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 2.9 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , WITH APPROXIMATELY 93 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED 3-CHLOROPHENOL IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 93 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 79.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .31 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT 3-CHLOROPHENOL LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000052 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF 3-CHLOROPHENOL IN FISH MAY BE 44.2 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS SIGNIFICANT, RANGING FROM 29 % TO 46 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- 3-CHLOROPHENOL -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	26000	1
RATIO OF MOLECULAR WEIGHTS OF 3-CHLOROPHENOL TO OXYGEN	4.0	2
OCTANOL/WATER PARTITION COEFFICIENT	320	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	.048	4
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.048	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF 3-CHLOROPHENOL

1 Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-429.

2 Verschueren, Karel, 1977, Handbook of Environ. Data on Organic Chemicals, Van Nostrand, NY.

3 Compilation of solvent water partition coefficients as reported in the literature. Developed and maintained by Dr. Corlan Hansch, Pomona College, Pomona, California.

4 Verschueren, Karel, 1977, Handbook of Environ. Data on Organic Chemicals, Van Nostrand, NY.

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4-CHLOROPHENOL

THE POTENTIAL RELEASE RATES OF 4-CHLOROPHENOL FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF 4-CHLOROPHENOL THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF 4-CHLOROPHENOL CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

4-CHLOROPHENOL WAS FOUND TO BE THE MAJOR CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 4100000 MG PER SQUARE METER OF SURFACE AREA PER YEAR TO 16000000 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LANDFILLS AND .00 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS. 4-CHLOROPHENOL WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 2.3 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 9.1 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 34 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO 4-CHLOROPHENOL THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF

RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF 4-CHLOROPHENOL THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF 4-CHLOROPHENOL DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 8.4 % AND 46 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, RANGING FROM 54 % TO 92 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED 4-CHLOROPHENOL IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 8.1 % TO 45 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING 4-CHLOROPHENOL IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 65.8 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .13 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING 4-CHLOROPHENOL IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00013 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF 4-CHLOROPHENOL IN FISH MAY BE 38.5 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS HIGH RANGING FROM 38 % TO 83 %.

MOVEMENT OF 4-CHLOROPHENOL THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 11 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS HIGH WITH APPROXIMATELY84 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED 4-CHLOROPHENOL IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 11 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .25 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 65.8 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING 4-CHLOROPHENOL IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000083 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF 4-CHLOROPHENOL IN FISH MAY BE 38.5 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 22 % TO 34 %.

MOVEMENT OF 4-CHLOROPHENOL THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 2.9 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , WITH APPROXIMATELY 93 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED 4-CHLOROPHENOL IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 93 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 65.8 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .26 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT 4-CHLOROPHENOL LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000045 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF 4-CHLOROPHENOL IN FISH MAY BE 38.5 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS SIGNIFICANT, RANGING FROM 29 % TO 46 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- 4-CHLOROPHENOL -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	27000	1
RATIO OF MOLECULAR WEIGHTS OF 4-CHLOROPHENOL TO OXYGEN	4.0	2
OCTANOL/WATER PARTITION COEFFICIENT	260	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	.048	4
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.048	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF 4-CHLOROPHENOL

THE FOLLOWING TABLE PROVIDES EXAMPLES OF ACTUAL DATA, FROM CHEMICAL ANALYSIS, LISTED IN EPA'S DISTRIBUTION REGISTER OF ORGANIC POLLUTANTS IN WATER (WATER DROP) AS DESCRIBED BY GARRISON ET. AL. (1979). DATA ARE LISTED FOR ONLY THE CATEGORIES RAW DRINKING WATER, FINISHED DRINKING WATER, SURFACE WATER AND WELL WATER.

REPORTED OBSERVATIONS OF P-CHLOROPHENOL IN MAJOR MEDIA CATEGORIES

SAMPLE DESCRIPTION	MAXIMUM CONCENTRATION REPORTED, (UG/L)	REFERENCE
SURFACE WATER	0.008	1

1. LIN, D.C.K., ET AL., (BATTELLE COLUMBUS LABS.) "GC/MS ANALYSIS OF ORGANICS IN DRINKING WATER CONCENTRATES AND ADVANCED WASTE TREATMENT CONCENTRATES: LAKE TAHOE II ACIDIFIED METHYLENE CHLORIDE CONCENCTRATE ANALYSIS REPORT," VOL. I, 1979.

1 Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. B-429.

2 Verschueren, Karel, 1977, Handbook of Environ. Data on Organic Chemicals, Van Nostrand, NY.

3 Compilation of solvent water partition coefficients as reported in the literature. Developed and maintained by Dr. Corlan Hansch, Pomona College, Pomona, California.

4 Verschueren, Karel, 1977, Handbook of Environ. Data on Organic Chemicals, Van Nostrand, NY.

CREOSOTE

THE POTENTIAL RELEASE RATES OF CREOSOTE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF CREOSOTE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF CREOSOTE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~.
ATTACHMENT 1.

CREOSOTE WAS FOUND TO BE THE MAJOR CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 750000 MG PER SQUARE METER OF SURFACE AREA PER YEAR TO 3000000 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LANDFILLS AND .00 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO CREOSOTE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF CREOSOTE THAT DETERMINE ITS MOVEMENT AND DEGRADATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~.
ATTACHMENT 1.

MOVEMENT OF CREOSOTE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 2.0 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS HIGH WITH APPROXIMATELY98 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED CREOSOTE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY 2.0 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00094 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING CREOSOTE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000023% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF CREOSOTE IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE PONDS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF CREOSOTE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .57 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , WITH APPROXIMATELY 99 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED CREOSOTE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 99 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0010 % OF THE AMOUNT

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF CREOSOTE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 9.1 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, WITH APPROXIMATELY 91 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED CREOSOTE IN A RIVER REACH TRAVERSED IN 5 DAYS IS LOW, WITH APPROXIMATELY 9.1 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING CREOSOTE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000095 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING CREOSOTE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000011 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF CREOSOTE IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RIVERS TO THE ATMOSPHERE SHOULD OCCUR.

EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT CREOSOTE LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000013% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF CREOSOTE IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RESERVOIRS OR LAKES TO THE ATMOSPHERE SHOULD OCCUR.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- CREOSOTE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	5000	1
RATIO OF MOLECULAR WEIGHTS OF CREOSOTE TO OXYGEN	4.3	2
OCTANOL/WATER PARTITION COEFFICIENT	1.0	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	.48	4
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.48	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF CREOSOTE

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1 Mabey, W. R., Mill, T., Hendry, D. G., Chou, T., Johnson, H. L., Best Judgement. SRI International.

2 Mabey, W. R., Mill, T., Hendry, D. G., Chou, T., Johnson, H. L., Best Judgement. SRI International.

3 Best Judgement by J. W. Falco, EPA-ERL, Atrens, Georgia.

4 Verschueren, Karel, 1977, Handbook of Environ. Data on Organic Chemicals, Van Nostrand, NY.

CHROMIUM

THE POTENTIAL RELEASE RATES OF CHROMIUM FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF CHROMIUM THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF CHROMIUM CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT 1.

CHROMIUM WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 600 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 2400 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 8800 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO CHROMIUM THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF CHROMIUM THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT 1. BECAUSE NO

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DEGRADATION DATA WERE AVAILABLE, THE RESULTS OF THE ANALYSIS SUBSEQUENTLY PRESENTED PROVIDES ESTIMATES OF THE RELATIVE PARTITIONING ONLY BETWEEN AIR, WATER, AND SEDIMENT MEDIA.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF CHROMIUM DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE WIDESPREAD. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 100 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE PROJECTED AMOUNT OF DISSOLVED CHROMIUM IN A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, WITH APPROXIMATELY 100 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING CHROMIUM IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0010 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING CHROMIUM IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000029 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF CHROMIUM IN FISH MAY BE 0.6 TIMES AS

GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RIVERS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF CHROMIUM THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE WIDESPREAD. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 100 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE PROJECTED AMOUNT OF DISSOLVED CHROMIUM IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS HIGH, WITH APPROXIMATELY 100 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0010 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING CHROMIUM IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000011 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF CHROMIUM IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE PONDS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF CHROMIUM THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE WIDESPREAD. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 100 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE PROJECTED AMOUNT OF DISSOLVED CHROMIUM IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS HIGH, WITH APPROXIMATELY .0044 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0010 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A

RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT CHROMIUM LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000024 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF CHROMIUM IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RESERVOIRS OR LAKES TO THE ATMOSPHERE SHOULD OCCUR.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- CHROMIUM -----

PARAMETER	VALUE	REFERE
SOLUBILITY (MG/L)	20	1
RATIO OF MOLECULAR WEIGHTS OF CHROMIUM TO OXYGEN	1.6	2
OCTANOL/WATER PARTITION COEFFICIENT	1.0	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATES A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF CHROMIUM

1 Criteria Document prepared for Priority Pollutants per Section 307 of the Federal Water Pollution Control Act and the Clean Water Act as amended under contract for the U.S. Environmental Protection Agency.

2 Dawson, G. W., English, C. J., Petty, S. E., Best Estimate by Battelle Northwest.

3 Best Judgement by J. W. Falco, EPA-ERL, Athens, Georgia.

O-DICHLOROBENZENE

THE POTENTIAL RELEASE RATES OF O-DICHLOROBENZENE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF O-DICHLOROBENZENE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF O-DICHLOROBENZENE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

O-DICHLOROBENZENE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM .24 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO .96 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 3.5 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO O-DICHLOROBENZENE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF O-DICHLOROBENZENE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF

THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT I.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF O-DICHLOROBENZENE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .22 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, WITH APPROXIMATELY 100 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED O-DICHLOROBENZENE IN A RIVER REACH TRAVERSED IN 5 DAYS IS LOW, WITH APPROXIMATELY .18 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING O-DICHLOROBENZENE IS SIGNIFICANT. CONCENTRATION IN THE SEDIMENT MAY BE 628.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0058 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING O-DICHLOROBENZENE IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00017 % OF THE

AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF O-DICHLOROBENZENE IN FISH MAY BE 209.3 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS SIGNIFICANT RANGING FROM 8.2 % TO 27 %.

MOVEMENT OF O-DICHLOROBENZENE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .66 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE PETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS HIGH RANGING FROM 76 % TO 97 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED O-DICHLOROBENZENE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY .65 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 2.3 % AND 23 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 628.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING O-DICHLOROBENZENE IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000033 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF O-DICHLOROBENZENE IN FISH MAY BE 209.3 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY 1.0 %.

MOVEMENT OF O-DICHLOROBENZENE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .18 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , RANGING FROM 76 % TO 97 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED O-DICHLOROBENZENE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 76 % OF THE

TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS SIGNIFICANT. CONCENTRATION IN THE SEDIMENT MAY BE 628.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, BETWEEN 2.4 % AND 24 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT O-DICHLOROBENZENE LOADS IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000019 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF O-DICHLOROBENZENE IN FISH MAY BE 209.3 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS LOW WITH APPROXIMATELY 1.3 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- O-DICHLOROBENZENE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	120	1
RATIO OF MOLECULAR WEIGHTS OF O-DICHLOROBENZENE TO OXYGEN	4.6	2
OCTANOL/WATER PARTITION COEFFICIENT	2500	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	1.1	4
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	1.1	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF O-DICHLOROBENZENE

1 Verschueren, Karel, 1977, Handbook of Environ, Data on Organic Chemicals, Van Nostrand, NY.

2 Verschueren, Karel, 1977, Handbook of Environ, Data on Organic Chemicals, Van Nostrand, NY.

3 Neely, W. B., "Persistence Protocol Project," Workshop on Persistence for the National Research Council, Ottawa, Canada, April, 1978.

4 Verschueren, Karel, 1977, Handbook of Environ, Data on Organic Chemicals, Van Nostrand, NY.

P-DICHLOROBENZENE

THE POTENTIAL RELEASE RATES OF P-DICHLOROBENZENE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF P-DICHLOROBENZENE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF P-DICHLOROBENZENE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~.
ATTACHMENT 1.

P-DICHLOROBENZENE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM .24 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO .98 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 3.6 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO P-DICHLOROBENZENE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF P-DICHLOROBENZENE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF

THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF P-DICHLOROBENZENE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .17 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, WITH APPROXIMATELY 100 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED P-DICHLOROBENZENE IN A RIVER REACH TRAVERSED IN 5 DAYS IS LOW, WITH APPROXIMATELY .15 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING P-DICHLOROBENZENE IS SIGNIFICANT. CONCENTRATION IN THE SEDIMENT MAY BE 612.5 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0044 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING P-DICHLOROBENZENE IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00016 % OF THE

AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF P-DICHLOROBENZENE IN FISH MAY BE 205.5 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS SIGNIFICANT RANGING FROM 7.9 % TO 27 %.

MOVEMENT OF P-DICHLOROBENZENE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .64 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS HIGH RANGING FROM 77 % TO 97 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED P-DICHLOROBENZENE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY .63 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 2.2 % AND 23 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 612.5 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING P-DICHLOROBENZENE IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000031 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF P-DICHLOROBENZENE IN FISH MAY BE 205.5 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY .98 %.

MOVEMENT OF P-DICHLOROBENZENE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .17 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , RANGING FROM 77 % TO 97 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED P-DICHLOROBENZENE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 77 % OF THE

TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS SIGNIFICANT. CONCENTRATION IN THE SEDIMENT MAY BE 612.5 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, BETWEEN 2.4 % AND 23 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT P-DICHLOROBENZENE LOADS IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000018 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF P-DICHLOROBENZENE IN FISH MAY BE 205.5 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS LOW WITH APPROXIMATELY 1.3 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- P-DICHLOROBENZENE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	79	1
RATIO OF MOLECULAR WEIGHTS OF P-DICHLOROBENZENE TO OXYGEN	4.6	2
OCTANOL/WATER PARTITION COEFFICIENT	2500	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	1.2	4
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	1.2	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF P-DICHLOROBENZENE

1 Verschueren, Karel, 1977, Handbook of Environ. Data on Organic Chemicals, Van Nostrand, NY.

2 Verschueren, Karel, 1977, Handbook of Environ. Data on Organic Chemicals, Van Nostrand, NY.

3 Kenaga, E. E., and C. A. I. Goring, "Relationship Between Water Solubility, Soil Sorption, Octanol-Water Partitioning, and Bioconcentration of Chemicals in Biota," ASTM Third Aquatic Toxicology Symposium, New Orleans, Oct. 17 and 18, 1978.

4 Verschueren, Karel, 1977, Handbook of Environ. Data on Organic Chemicals, Van Nostrand, NY.

1,2-DICHLOR~~A~~ETHANE

THE POTENTIAL RELEASE RATES OF 1,2-DICHLOR~~A~~ETHANE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF 1,2-DICHLOR~~A~~ETHANE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF 1,2-DICHLORATHANE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

1,2-DICHLOR~~A~~ETHANE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 19 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 76 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 280 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO 1,2-DICHLOR~~A~~ETHANE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF 1,2-DICHLOR~~A~~ETHANE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF

THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF 1,2-DICHLOR~~A~~ETHANE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 2.7 % AND 20 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, RANGING FROM 80 % TO 97 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED 1,2-DICHLOR~~A~~ETHANE IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 2.6 % TO 20 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING 1,2-DICHLOR~~A~~ETHANE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 7.9 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0065 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING 1,2-DICHLORATHANE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000019 % OF THE

AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF 1,2-DICHLOR~~A~~ETHANE IN FISH MAY BE 7.9 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS SIGNIFICANT RANGING FROM 31 % TO 71 %.

MOVEMENT OF 1,2-DICHLOR~~A~~ETHANE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 4.1 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS HIGH WITH APPROXIMATELY95 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED 1,2-DICHLORATHANE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY 4.1 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .030 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 7.9 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING 1,2-DICHLOR~~A~~ETHANE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000061 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF 1,2-DICHLOR~~A~~ETHANE IN FISH MAY BE 7.9 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 8.3 % TO 14 %.

MOVEMENT OF 1,2-DICHLOR~~A~~ETHANE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 1.1 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , WITH APPROXIMATELY 98 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED 1,2-DICHLOR~~A~~ETHANE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 98 % OF THE

TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 7.9 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .032 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT 1,2-DICHLOR~~A~~ETHANE LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000034 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF 1,2-DICHLOR~~A~~ETHANE IN FISH MAY BE 7.9 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS SIGNIFICANT, RANGING FROM 11 % TO 19 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- 1,2-DICHLOR~~A~~eTHANE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	8700	1
RATIO OF MOLECULAR WEIGHTS OF 1,2-DICHLORATHANE TO OXYGEN	3.1	2
OCTANOL/WATER PARTITION COEFFICIENT	32	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	.20	4
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.20	

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IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF 1,2-DICHLOR~~A~~eTHANE

THE FOLLOWING TABLE PROVIDES EXAMPLES OF ACTUAL DATA, FROM CHEMICAL ANALYSIS, LISTED IN EPA'S DISTRIBUTION REGISTER OF ORGANIC POLLUTANTS IN WATER (WATER DROP) AS DESCRIBED BY GARRISON ET. AL. (1979). DATA ARE LISTED FOR ONLY THE CATEGORIES RAW DRINKING WATER, FINISHED DRINKING WATER, SURFACE WATER AND WELL WATER.

REPORTED OBSERVATIONS OF

1,2-DICHLOROETHANE

IN MAJOR MEDIA CATEGORIES

SAMPLE DESCRIPTION	MAXIMUM CONCENTRATION REPORTED, (UG/L)	REFERENCE
DRINKING WATER, FINISHED	6	1

1. ANALYTICAL REPORT: NEW ORLEANS AREA WATER SUPPLY STUDY; EPA 906/9-75-003 UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, REGION VI, DALLAS, TX, DEC.9, 1975, 95 PAGES, NTIS

1 Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-292.

2 Daniels, S. L., W. B. Neely and R. E. Bailey, "Toxic 'Priority' Pollutant Perspectives," Environmental Sciences Research, Dow Chemical Company, May 9, 1979.

3 Daniels, S. L., W. B. Neely and R. E. Bailey, "Toxic 'Priority' Pollutant Perspectives," Environmental Sciences Research, Dow Chemical Company, May 9, 1979.

4 Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by the U.S. Environmental Protection Agency.

2,4-DICHLOROPHENOL

THE POTENTIAL RELEASE RATES OF 2,4-DICHLOROPHENOL FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF 2,4-DICHLOROPHENOL THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF 2,4-DICHLOROPHENOL CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

2,4-DICHLOROPHENOL WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM .43 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 1.7 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 6.4 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO 2,4-DICHLOROPHENOL THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF 2,4-DICHLOROPHENOL THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF

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POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF 2,4-DICHLOROPHENOL DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .34 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, WITH APPROXIMATELY 99 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED 2,4-DICHLOROPHENOL IN A RIVER REACH TRAVERSED IN 5 DAYS IS LOW, WITH APPROXIMATELY .29 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING 2,4-DICHLOROPHENOL IS SIGNIFICANT. CONCENTRATION IN THE SEDIMENT MAY BE 345.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0095 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING 2,4-DICHLOROPHENOL IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00013 % OF THE

AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF 2,4-DICHLOROPHENOL IN FISH MAY BE 133.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS SIGNIFICANT RANGING FROM 9.5 % TO 31 %.

MOVEMENT OF 2,4-DICHLOROPHENOL THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .91 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS HIGH RANGING FROM 85 % TO 98 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED 2,4-DICHLOROPHENOL IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY .91 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 1.3 % AND 14 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 345.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING 2,4-DICHLOROPHENOL IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000026 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF 2,4-DICHLOROPHENOL IN FISH MAY BE 133.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY 1.3 %.

MOVEMENT OF 2,4-DICHLOROPHENOL THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .25 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , RANGING FROM 85 % TO 98 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED 2,4-DICHLOROPHENOL IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 85 % OF THE

TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS SIGNIFICANT. CONCENTRATION IN THE SEDIMENT MAY BE 345.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, BETWEEN 1.4 % AND 15 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT 2,4-DICHLOROPHENOL LOADS IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000015 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF 2,4-DICHLOROPHENOL IN FISH MAY BE 133.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS LOW WITH APPROXIMATELY 1.7 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

2xe

----- 2,4-DICHLOROPHENOL -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	4600	1
RATIO OF MOLECULAR WEIGHTS OF 2,4-DICHLOROPHENOL TO OXYGEN	5.1	2
OCTANOL/WATER PARTITION COEFFICIENT	1400	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	.92	4
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.92	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF 2,4-DICHLOROPHENOL

Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-430.

Verschueren, Karel, 1977, Handbook of Environ. Data on Organic Chemicals, Van Nostrand, NY.

Compilation of solvent water partition coefficients as reported in the literature. Developed and maintained by Dr. Corlan Hansch, Pomona College, Pomona, California.

EPA Criteria Document, Chlorinated Phenols.

2+2

2,6-DICHLOROPHENOL

THE POTENTIAL RELEASE RATES OF 2,6-DICHLOROPHENOL FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF 2,6-DICHLOROPHENOL THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF 2,6-DICHLOROPHENOL CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

2,6-DICHLOROPHENOL WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM .13 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO .53 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 1.9 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO 2,6-DICHLOROPHENOL THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF 2,6-DICHLOROPHENOL THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF

THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF 2,6-DICHLOROPHENOL DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 20 % AND 34 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 66 % TO 80 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED 2,6-DICHLOROPHENOL IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 19 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING 2,6-DICHLOROPHENOL IS HIGH. CONCENTRATION IN THE SEDIMENT MAY BE 1142.5 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, BETWEEN .92 % AND 12 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING 2,6-DICHLOROPHENOL IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00078 % OF THE

AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF 2,6-DICHLOROPHENOL IN FISH MAY BE 327.9 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RIVERS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF 2,6-DICHLOROPHENOL THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 1.9 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS HIGH RANGING FROM 63 % TO 93 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED 2,6-DICHLOROPHENOL IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY 1.9 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS HIGH. BASED ON THE ANALYSIS PERFORMED, BETWEEN 4.1 % AND 35 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 1142.5 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING 2,6-DICHLOROPHENOL IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00017 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF 2,6-DICHLOROPHENOL IN FISH MAY BE 327.9 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE PONDS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF 2,6-DICHLOROPHENOL THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .52 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , RANGING FROM 63 % 10 95 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED 2,6-DICHLOROPHENOL IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 63 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS HIGH. CONCENTRATION IN THE SEDIMENT MAY BE 1142.5 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, BETWEEN 4.4 % AND 36 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT 2,6-DICHLOROPHENOL LOADS IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00010 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF 2,6-DICHLOROPHENOL IN FISH MAY BE 327.9 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RESERVOIRS OR LAKES TO THE ATMOSPHERE SHOULD OCCUR.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

2X6

----- 2,6-DICHLOROPHENOL -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	.28	1
RATIO OF MOLECULAR WEIGHTS OF 2,6-DICHLOROPHENOL TO OXYGEN	5.1	2
OCTANOL/WATER PARTITION COEFFICIENT	4600	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.34	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF 2,6-DICHLOROPHENOL

1 Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-430.

2 Chiou, C. T., U. H. Freed, D. W. Schmedding, and R. L. Kohnert, 1977, "Partition Coefficients and Bioaccumulation of Selected Organic Chemicals," Env. Sci. Technol., 11:475-78.

3 Values of Kow were calculated using a computer routine developed at SRI by Johnson and Leibrand (1980) which uses group values reported by Hansch and Leo (1979).

4 Tabak, H. H., C. W. Chambers, and P. W. Kabler, 1964, Microbial Metabolism of Aromatic Compounds, I. Decomposition of Phenolic Compounds and Aromatic Hydrocarbons by Phenol-Adapted Bacteria, J. Bacteriol., 87:910-919.

5 Howard, J. A. and E. Furimsky, 1973, Arrhenius Parameters for Reaction of tert-Butylperoxy Radicals with Some Hindered Phenols and Aromatic Amines, Can. J. Chem. 51:3738.

2,4-D

THE POTENTIAL RELEASE RATES OF 2,4-D FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF 2,4-D THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF 2,4-D CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT 1.

2,4-D WAS FOUND TO BE THE MAJOR CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 93000 MG PER SQUARE METER OF SURFACE AREA PER YEAR TO 370000 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LANDFILLS AND .00 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO 2,4-D THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF 2,4-D THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF 2,4-D DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE WIDESPREAD. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 89 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 11 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED 2,4-D IN A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, RANGING FROM 83 % TO 88 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING 2,4-D IS SIGNIFICANT. CONCENTRATION IN THE SEDIMENT MAY BE 161.3 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, BETWEEN .60 % AND 6.7 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING 2,4-D IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00035 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF 2,4-D IN FISH MAY BE 75.5 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RIVERS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF 2,4-D THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 27 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS SIGNIFICANT WITH APPROXIMATELY65 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED 2,4-D IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 27 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN .62 % AND 7.3 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 161.3 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING 2,4-D IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00042 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF 2,4-D IN FISH MAY BE 75.5 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE PONDS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF 2,4-D THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 9.5 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , RANGING FROM 83 % TO 89 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED 2,4-D IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 83 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS SIGNIFICANT. CONCENTRATION IN THE SEDIMENT MAY BE 161.3 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION.

BASED ON THE ANALYSIS PERFORMED, BETWEEN .64 % AND 7.4 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT 2,4-D LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00031 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF 2,4-D IN FISH MAY BE 75.5 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RESERVOIRS OR LAKES TO THE ATMOSPHERE SHOULD OCCUR.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- 2,4-D -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	620	1
RATIO OF MOLECULAR WEIGHTS OF 2,4-D TO OXYGEN	6.9	2
OCTANOL/WATER PARTITION COEFFICIENT	650	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.024	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF 2,4-D

THE FOLLOWING TABLE PROVIDES EXAMPLES OF ACTUAL DATA, FROM CHEMICAL ANALYSIS, LISTED IN EPA'S DISTRIBUTION REGISTER OF ORGANIC POLLUTANTS IN WATER (WATER DROP) AS DESCRIBED BY GARRISON ET. AL. (1979). DATA ARE LISTED FOR ONLY THE CATEGORIES RAW DRINKING WATER, FINISHED DRINKING WATER, SURFACE WATER AND WELL WATER.

REPORTED OBSERVATIONS OF

2,4-DICHLOROPHENOXYACETIC ACID

IN MAJOR MEDIA CATEGORIES

SAMPLE DESCRIPTION	MAXIMUM CONCENTRATION REPORTED, (UG/L)	REFERENCE
SURFACE WATER	0.30	1

1. PESTICIDE MONITORING JOURNAL, 3,124 (1969)

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1 Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-92.

2 Chemical Week Pesticides Register.

3 Compilation of solvent water partition coefficients as reported in the literature. Developed and maintained by Dr. Corlan Hansch, Pomona College, Pomona, California.

4 Verschueren, Karel, 1977, Handbook of Environ. Data on Organic Chemicals, Van Nostrand, NY.

5 Wolfe, N. L., R. G. Zepp, G. Baughman, R. C. Fincher, and J. A. Gordon, 1976, Chemical and Photochemical Transformation of Selected Pesticides in Aquatic Systems, EPA Report EPA-600/3-76-067, Sept. 1976.

DICHLOROPROPANE

THE POTENTIAL RELEASE RATES OF DICHLOROPROPANE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF DICHLOROPROPANE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF DICHLOROPROPANE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT 1.

DICHLOROPROPANE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 6.0 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 24 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 88 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO DICHLOROPROPANE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF DICHLOROPROPANE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF

THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT I. BECAUSE NO DEGRADATION DATA WERE AVAILABLE, THE RESULTS OF THE ANALYSIS SUBSEQUENTLY PRESENTED PROVIDES ESTIMATES OF THE RELATIVE PARTITIONING ONLY BETWEEN AIR, WATER, AND SEDIMENT MEDIA.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF DICHLOROPROPANE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 7.7 % AND 54 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE PROJECTED AMOUNT OF DISSOLVED DICHLOROPROPANE IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 7.6 % TO 54 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING DICHLOROPROPANE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 25.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .057 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING DICHLOROPROPANE IS LOW. BASED ON THE

ANALYSIS PERFORMED, APPROXIMATELY .000070 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF DICHLOROPROPANE IN FISH MAY BE 18.7 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS HIGH RANGING FROM 46 % TO 92 %.

MOVEMENT OF DICHLOROPROPANE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 23 % AND 35 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE PROJECTED AMOUNT OF DISSOLVED DICHLOROPROPANE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 23 % TO 35 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .096 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 25.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING DICHLOROPROPANE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000082 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF DICHLOROPROPANE IN FISH MAY BE 18.7 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 64 % TO 77 %.

MOVEMENT OF DICHLOROPROPANE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 5.4 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE PROJECTED AMOUNT OF DISSOLVED DICHLOROPROPANE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 89 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 25.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .10 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT DICHLOROPROPANE LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000040 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF DICHLOROPROPANE IN FISH MAY BE 18.7 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS HIGH, RANGING FROM 89 % TO 95 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- DICHLOROPROPANE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	2700	1
RATIO OF MOLECULAR WEIGHTS OF DICHLOROPROPANE TO OXYGEN	3.2	2
OCTANOL/WATER PARTITION COEFFICIENT	100	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATES A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF DICHLOROPROPANE

THE FOLLOWING TABLE PROVIDES EXAMPLES OF ACTUAL DATA, FROM CHEMICAL ANALYSIS, LISTED IN EPA'S DISTRIBUTION REGISTER OF ORGANIC POLLUTANTS IN WATER (WATER DROP) AS DESCRIBED BY GARRISON ET. AL. (1979). DATA ARE LISTED FOR ONLY THE CATEGORIES RAW DRINKING WATER, FINISHED DRINKING WATER, SURFACE WATER AND WELL WATER.

REPORTED OBSERVATIONS OF
DICHLOROPROPANE
IN MAJOR MEDIA CATEGORIES

SAMPLE DESCRIPTION	MAXIMUM CONCENTRATION REPORTED, (UG/L)	REFERENCE
SURFACE WATER	2	1

1. MONITORING TO DETECT PREVIOUSLY UNRECOGNIZED POLLUTANTS IN SURFACE WATERS, OFFICE OF TOXIC SUBSTANCES, U.S. ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. 20460,EPA-560/6-77-015,JULY 1977, 375 PP, NTIS

1 "Chemical Hazards Response Information System (CHRIS); Hazardous Chemical Data," CG-446-2, U.S. Coast Guard, 1974.

2 Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by the U.S. Environmental Protection Agency.

3 Compilation of solvent water partition coefficients as reported in the literature. Developed and maintained by Dr. Corlan Hansch, Pomona College, Pomona, California.

2,3-DICHLOROPROPANE

THE POTENTIAL RELEASE RATES OF 2,3-DICHLOROPROPANE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF 2,3-DICHLOROPROPANE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF 2,3-DICHLOROPROPANE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

2,3-DICHLOROPROPANE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 600 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 2400 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 8800 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO 2,3-DICHLOROPROPANE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF 2,3-DICHLOROPROPANE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF

THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT I. BECAUSE NO DEGRADATION DATA WERE AVAILABLE, THE RESULTS OF THE ANALYSIS SUBSEQUENTLY PRESENTED PROVIDES ESTIMATES OF THE RELATIVE PARTITIONING ONLY BETWEEN AIR, WATER, AND SEDIMENT MEDIA.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF 2,3-DICHLOROPROPANE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 8.2 % AND 55 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE PROJECTED AMOUNT OF DISSOLVED 2,3-DICHLOROPROPANE IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 8.2 % TO 55 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING 2,3-DICHLOROPROPANE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00058 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING 2,3-DICHLOROPROPANE IS LOW. BASED ON THE

ANALYSIS PERFORMED, APPROXIMATELY .0000022 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF 2,3-DICHLOROPROPANE IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS HIGH RANGING FROM 45 % TO 92 %.

MOVEMENT OF 2,3-DICHLOROPROPANE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 24 % AND 36 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE PROJECTED AMOUNT OF DISSOLVED 2,3-DICHLOROPROPANE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 24 % TO 36 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00096 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING 2,3-DICHLOROPROPANE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000027 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF 2,3-DICHLOROPROPANE IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 64 % TO 76 %.

MOVEMENT OF 2,3-DICHLOROPROPANE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 5.6 % AND 11 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE PROJECTED AMOUNT OF DISSOLVED 2,3-DICHLOROPROPANE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS SIGNIFICANT, RANGING FROM 89 % TO 94 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0010 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT 2,3-DICHLOROPROPANE LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000013 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF 2,3-DICHLOROPROPANE IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS HIGH, RANGING FROM 89 % TO 94 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- 2,3-DICHLOROPROPANE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	100	1
RATIO OF MOLECULAR WEIGHTS OF 2,3-DICHLOROPROPANE TO OXYGEN	3.5	2
OCTANOL/WATER PARTITION COEFFICIENT	1.0	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATES A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF 2,3-DICHLOROPROPANE

1 Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-464.

2 Dawson, G. W., English, C. J., Petty, S. E., Best Estimate by Battelle Northwest.

3 Values of Kow were calculated using a computer routine developed at SRI by Johnson and Leibrand (1980) which uses group values reported by Hansch and Leo (1979).

DIELDRIN

The potential release rates of DIELDRIN from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of DIELDRIN that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of DIELDRIN can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1.

DIELDRIN was found to be a contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from .37 mg per square meter of surface area per fraction of the waste stream per year to 1.5 mg per square meter of surface area per fraction of the waste stream per year for landfills and 5.5 mg per square meter of surface area per fraction of the waste stream per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to DIELDRIN through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of DIELDRIN that determine its movement and degredation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of DIELDRIN downstream from points of discharge in rivers is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The potential for degradation or elimination of this compound from a river reach traversed in 5 days is low, with approximately .42 % of the total amount emitted. The projected amount of dissolved DIELDRIN in a river reach traversed in 5 days is high, ranging from 83 % to 98 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving DIELDRIN is significant. Concentration in the sediment may be 400.0 times as great as ambient water concentration. Based on the analysis performed, between 1.6 % and 17 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving DIELDRIN is significant. Based on the analysis performed, approximately .00073 % of the amount emitted will be taken up by fish. Concentrations of DIELDRIN in fish may be 149.3 times as great as dissolved concentrations. Virtually no releases from the rivers to the atmosphere should occur.

Movement of DIELDRIN through ponds and small reservoirs is projected to be widespread. Based on the analysis performed, between 76 % and 90 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The potential for degradation or elimination of this compound in such a pond is low with approximately 7.6 % of the total amount emitted. The projected amount of dissolved DIELDRIN in a pond characterized by a retention time of 100 days is high, ranging from 76 % to 89 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is significant. Based on the analysis performed, between 1.6 % and 17 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 400.0 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving DIELDRIN is significant. Based on the analysis performed, approximately .0025 % of the amount emitted will be taken up by fish. Concentrations of DIELDRIN in fish may be 149.3 times as great as dissolved concentrations. Virtually no releases from the ponds to the atmosphere should occur.

Movement of DIELDRIN through reservoirs and lakes is projected to be significant. Based on the analysis performed, between 61 % and 72 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The potential for degradation or elimination of this compound in such a reservoir or lake is significant , with approximately 22 % of the total amount emitted. The projected amount of dissolved DIELDRIN in a reservoir or lake characterized by a retention time of 365 days is significant, ranging from 22 % to 26 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is significant. Concentration in the sediment may be 400.0 times as great as ambient water concentration. Based on the analysis performed, between 1.6 % and 17 %

EXL

of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant DIELDRIN loads is significant. Based on the analysis performed, approximately .0043 % of the amount emitted will be taken up by fish. Concentrations of DIELDRIN in fish may be 149.3 times as great as dissolved concentrations. Virtually no releases from the reservoirs or lakes to the atmosphere should occur.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- DIELDRIN -----

Parameter	Value	Referen
Solubility (mg/l)	.25	1
Ratio of molecular weights of DIELDRIN to oxygen	12	2
Octanol/water Partition Coefficient	1600	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	n.a.	
Microbial degradation rate constant (/days)	n.a.	
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	.0010	4

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicate a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of DIELDRIN

The following table provides examples of actual data, from chemical analysis, listed in EPA's Distribution Register of Organic Pollutants in Water (Water DROP) as described by Garrison et. al. (1979). Data are listed for only the categories raw drinking water, finished drinking water, surface water and well water.

Reported Observations of

Dieldrin

in Major Media Categories

Sample Description	Maximum Concentration Reported, (ug/l)	Reference
Drinking water, finished	0.1	1
Drinking water, unfinished	0.0005	2
Surface water	0.12	3
Well water	0.0005	4

1. Environmental Science and Technology, 3,1261 (1969)

2. Pesticide Monitoring Journal 9,117 (1975)

3. Public Health Reports, (Government Printing Office, Supt. of Doc., Washington, D.C. 20402) V.1- 1878 - Public Health Report 82,139 (1967)

4. Pesticide Monitoring Journal 9,117 (1975)

1 Chemical Week Pesticides Register.

2 Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by the U.S. Environmental Protection Agency.

3 Values of Kow were calculated using a computer routine developed at SRI by Johnson and Leibrand (1980) which uses group values reported by Hansch and Leo (1979).

4 Dave Pimentel, "Ecological Effects of Pesticides on Now-Target Species," Office of Science and Technology, Washington, DC, 1971.

0,0-DIETHYL-S-METHYL-THIOATE.

THE POTENTIAL RELEASE RATES OF 0,0-DIETHYL-S-METHYL-THIOATE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF 0,0-DIETHYL-S-METHYL-THIOATE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF 0,0-DIETHYL-S-METHYL-THIOATE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT I.

0,0-DIETHYL-S-METHYL-THIOATE WAS FOUND TO BE THE MAJOR CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 15000 MG PER SQUARE METER OF SURFACE AREA PER YEAR TO 60000 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LANDFILLS AND .00 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO 0,0-DIETHYL-S-METHYL-THIOATE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF 0,0-DIETHYL-S-METHYL-THIOATE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE

EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ATTACHMENT 1. ~~APPENDIX A~~. BECAUSE NO DEGRADATION DATA WERE AVAILABLE, THE RESULTS OF THE ANALYSIS SUBSEQUENTLY PRESENTED PROVIDES ESTIMATES OF THE RELATIVE PARTITIONING ONLY BETWEEN AIR, WATER, AND SEDIMENT MEDIA.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF 0,0-DIETHYL-S-METHYL-THIOATE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE WIDESPREAD. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 100 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE PROJECTED AMOUNT OF DISSOLVED 0,0-DIETHYL-S-METHYL-THIOATE IN A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, WITH APPROXIMATELY 100 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING 0,0-DIETHYL-S-METHYL-THIOATE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0010 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE

POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING 0,0-DIETHYL-S-METHYL-THIOATE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000029 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF 0,0-DIETHYL-S-METHYL-THIOATE IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RIVERS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF 0,0-DIETHYL-S-METHYL-THIOATE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE WIDESPREAD. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 100 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE PROJECTED AMOUNT OF DISSOLVED 0,0-DIETHYL-S-METHYL-THIOATE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS HIGH, WITH APPROXIMATELY 100 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0010 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING 0,0-DIETHYL-S-METHYL-THIOATE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000011 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF 0,0-DIETHYL-S-METHYL-THIOATE IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE PONDS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF 0,0-DIETHYL-S-METHYL-THIOATE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE WIDESPREAD. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 100 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE PROJECTED AMOUNT OF DISSOLVED 0,0-DIETHYL-S-METHYL-THIOATE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS HIGH, WITH APPROXIMATELY .0044 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0010 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT O,O-DIETHYL-S-METHYL-THIOATE LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000024 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF O,O-DIETHYL-S-METHYL-THIOATE IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RESERVOIRS OR LAKES TO THE ATMOSPHERE SHOULD OCCUR.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- 0,0-DIETHYL-S-METHYL-THIOATE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	100	1
RATIO OF MOLECULAR WEIGHTS OF 0,0-DIETHYL-S-METHYL-THIOATE TO OXYGEN	6.3	2
OCTANOL/WATER PARTITION COEFFICIENT	1.0	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATES A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF 0,0-DIETHYL-S-METHYL-THIOATE

1 Dawson, G. W., English, C. J., Petty, S. E., Best estimate by Battelle Northwest.

2 Dawson, G. W., English, C. J., Petty, S. E., Best estimate by Battelle Northwest.

3 Best Judgement by J. W. Falco, EPA-ERL, Athens, Georgia.

DINITROBENZENE(M,P)

THE POTENTIAL RELEASE RATES OF DINITROBENZENE(M,P) FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF DINITROBENZENE(M,P) THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF DINITROBENZENE(M,P) CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT I.

DINITROBENZENE(M,P) WAS FOUND TO BE THE MAJOR CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 270000 MG PER SQUARE METER OF SURFACE AREA PER YEAR TO 1100000 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LANDFILLS AND .00 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS. DINITROBENZENE(M,P) WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 14 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 58 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 210 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO DINITROBENZENE(M,P) THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL

PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF DINITROBENZENE(M,P) THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT I. BECAUSE NO DEGRADATION DATA WERE AVAILABLE, THE RESULTS OF THE ANALYSIS SUBSEQUENTLY PRESENTED PROVIDES ESTIMATES OF THE RELATIVE PARTITIONING ONLY BETWEEN AIR, WATER, AND SEDIMENT MEDIA.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF DINITROBENZENE(M,P) DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE WIDESPREAD. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 100 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE PROJECTED AMOUNT OF DISSOLVED DINITROBENZENE(M,P) IN A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, WITH APPROXIMATELY 99 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING DINITROBENZENE(M,P) IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 10.4 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .044 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING DINITROBENZENE(M,P) IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000048 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF DINITROBENZENE(M,P) IN FISH MAY BE 9.7 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RIVERS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF DINITROBENZENE(M,P) THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE WIDESPREAD. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 99 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE PROJECTED AMOUNT OF DISSOLVED DINITROBENZENE(M,P) IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS HIGH, WITH APPROXIMATELY 99 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .044 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 10.4 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING DINITROBENZENE(M,P) IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00018 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF DINITROBENZENE(M,P) IN FISH MAY BE 9.7 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE PONDS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF DINITROBENZENE(M,P) THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE WIDESPREAD. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 99 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF

365 DAYS. THE PROJECTED AMOUNT OF DISSOLVED DINITROBENZENE(M,P) IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS HIGH, WITH APPROXIMATELY .0044 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 10.4 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .044 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT DINITROBENZENE(M,P) LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00039 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF DINITROBENZENE(M,P) IN FISH MAY BE 9.7 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RESERVOIRS OR LAKES TO THE ATMOSPHERE SHOULD OCCUR.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- DINITROBENZENE(M,P) -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	1800	1
RATIO OF MOLECULAR WEIGHTS OF DINITROBENZENE(M,P) TO OXYGEN	5.3	2
OCTANOL/WATER PARTITION COEFFICIENT	42	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATES A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF DINITROBENZENE(M,P)

1 Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-164.

2 Perry, R. H. and Chilton, C. H., Chemical Engineer's Handbook.

3 Values of Kow were calculated using a computer routine developed at SRI by Johnson and Leibrand (1980) which uses group values reported by Hansch and Leo (1979).

DISULFOTON

THE POTENTIAL RELEASE RATES OF DISULFOTON FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF DISULFOTON THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF DISULFOTON CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

DISULFOTON WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 17 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 67 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 250 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO DISULFOTON THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF DISULFOTON THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF DISULFOTON DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE WIDESPREAD. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 91 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS LOW, WITH APPROXIMATELY 9.1 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED DISULFOTON IN A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, WITH APPROXIMATELY 90 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING DISULFOTON IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 9.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .034 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING DISULFOTON IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000041 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF DISULFOTON IN FISH MAY BE 8.7 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RIVERS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF DISULFOTON THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 34 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS SIGNIFICANT WITH APPROXIMATELY65 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED DISULFOTON IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 34 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .035 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 9.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING DISULFOTON IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000056 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF DISULFOTON IN FISH MAY BE 6.7 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE PONDS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF DISULFOTON THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 12 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , WITH APPROXIMATELY 87 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED DISULFOTON IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 87 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 9.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE

ANALYSIS PERFORMED, APPROXIMATELY .036 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT DISULFOTON LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000043 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF DISULFOTON IN FISH MAY BE 8.7 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RESERVOIRS OR LAKES TO THE ATMOSPHERE SHOULD OCCUR.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- DISULFOTON -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	25	1
RATIO OF MOLECULAR WEIGHTS OF DISULFOTON TO OXYGEN	8.6	2
OCTANOL/WATER PARTITION COEFFICIENT	36	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.019	4

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF DISULFOTON

1 Chemical Week Pesticides Register.

2 Chemical Week Pesticides Register.

3 Values of Kow were calculated using a computer routine developed at SRI by Johnson and Leibrand (1980) which uses group values reported by Hansch and Leo (1979).

4 Mabey, W. R., Mill, T., Hendry, D. G., Chou, T., Johnson, H. L., Best Judgement. SRI International.

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EPICHLOROHYDRIN

THE POTENTIAL RELEASE RATES OF EPICHLOROHYDRIN FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF EPICHLOROHYDRIN THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF EPICHLOROHYDRIN CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

EPICHLOROHYDRIN WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 600 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 2400 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 8800 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO EPICHLOROHYDRIN THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF EPICHLOROHYDRIN THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF

THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF EPICHLOROHYDRIN DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, BETWEEN 1.1 % AND 9.1 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, RANGING FROM 91 % TO 99 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED EPICHLOROHYDRIN IN A RIVER REACH TRAVERSED IN 5 DAYS IS LOW, RANGING FROM 1.1 % TO 9.1 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING EPICHLOROHYDRIN IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000096 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING EPICHLOROHYDRIN IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000011 % OF THE

AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF EPICHLOROHYDRIN IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS SIGNIFICANT RANGING FROM 25 % TO 60 %.

MOVEMENT OF EPICHLOROHYDRIN THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 2.5 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS HIGH WITH APPROXIMATELY97 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED EPICHLOROHYDRIN IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY 2.5 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00094 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING EPICHLOROHYDRIN IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000028% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF EPICHLOROHYDRIN IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY 5.2 %.

MOVEMENT OF EPICHLOROHYDRIN THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .68 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , WITH APPROXIMATELY 99 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED EPICHLOROHYDRIN IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 99 % OF THE TOTAL

AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0010 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT EPICHLOROHYDRIN LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000016% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF EPICHLOROHYDRIN IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS SIGNIFICANT, RANGING FROM 6.7 % TO 13 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- EPICHLOROHYDRIN -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	66000	1
RATIO OF MOLECULAR WEIGHTS OF EPICHLOROHYDRIN TO OXYGEN	2.9	2
OCTANOL/WATER PARTITION COEFFICIENT	1.0	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.35	4

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF EPICHLOROHYDRIN

1 "Chemical Hazards Response Information System (CHRIS); Hazardous Chemical Data," CG-446-2, U.S. Coast Guard, 1974.

2 Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by U.S. EPA.

3 Values of Kow were calculated using a computer routine developed at SRI by Johnson and Leibrand (1980) which uses group values reported by Hansch and Leo (1979).

4 Criteria Document prepared for Priority Pollutants per Section 307 of the Federal Water Pollution Control Act and the Clean Water Act as amended under contract for the U.S. Environmental Protection Agency.

FORMALDEHYDE

The potential release rates of FORMALDEHYDE from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of FORMALDEHYDE that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of FORMALDEHYDE can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1.

FORMALDEHYDE was found to be a contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from 600 mg per square meter of surface area per fraction of the waste stream per year to 2400 mg per square meter of surface area per fraction of the waste stream per year for landfills and 8800 mg per square meter of surface area per fraction of the waste stream per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to FORMALDEHYDE through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of FORMALDEHYDE that determine its movement and degredation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1. Because no

degradation data were available, the results of the analysis subsequently presented provides estimates of the relative partitioning only between air, water, and sediment media.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of FORMALDEHYDE downstream from points of discharge in rivers is projected to be significant. Based on the analysis performed, between .82 % and 32 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The projected amount of dissolved FORMALDEHYDE in a river reach traversed in 5 days is significant, ranging from .82 % to 32 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving FORMALDEHYDE is low. Concentration in the sediment may be 0.2 times as great as ambient water concentration. Based on the analysis performed, approximately .00010 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving FORMALDEHYDE is low. Based on the analysis performed, approximately .0000018 % of the amount emitted will be taken up by fish. Concentrations of FORMALDEHYDE in fish may be 0.6 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a river reach traversed in 5 days (50 to 250 miles) is high ranging from 68 % to 99 %.

Movement of FORMALDEHYDE through ponds and small reservoirs is projected to be significant. Based on the analysis performed, between 14 % and 22 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The projected amount of dissolved FORMALDEHYDE in a pond characterized by a retention time of 100 days is significant, ranging from 14 % to 22 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is low. Based on the analysis performed, approximately .00095 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 0.2 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving FORMALDEHYDE is low. Based on the analysis performed, approximately .0000016 % of the amount emitted will be taken up by fish. Concentrations of FORMALDEHYDE in fish may be 0.6 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a pond surface with a retention time of 100 days is high, ranging from 78 % to 86 %.

Movement of FORMALDEHYDE through reservoirs and lakes is projected to be limited. Based on the analysis performed, approximately 3.0 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The projected amount of dissolved FORMALDEHYDE in a reservoir or lake characterized by a retention time of 365 days is low, with approximately 94 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is low. Concentration in the sediment may be 0.2 times as great as ambient water concentration. Based on the analysis performed, approximately .0010 % of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant FORMALDEHYDE loads is low. Based on the analysis performed, approximately .00000071% of the amount emitted will be taken up by fish. Concentrations of FORMALDEHYDE in fish may be 0.6 times as great as dissolved concentrations. Estimated potential release from a reservoir or lake with an average retention time of 365 days is high with approximately 94 %.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- FORMALDEHYDE -----

Parameter	Value	Referen
Solubility (mg/l)	1000000	1
Ratio of molecular weights of FORMALDEHYDE to oxygen	.94	2
Octanol/water Partition Coefficient	1.0	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	n.a.	
Microbial degradation rate constant (/days)	n.a.	
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	n.a.	

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicates a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of FORMALDEHYDE

1 Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-309.

2 "Chemical Hazards Response Information Service (CHRIS); Hazardous Chemical Data," CG-446-2, U.S. Coast Guard, 1974.

3 Best Judgement by J. W. Falco, EPA-ERL, Athens, Georgia.

FORMIC ACID

The potential release rates of FORMIC ACID from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of FORMIC ACID that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of FORMIC ACID can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~, Attachment 1.

FORMIC ACID was found to be a contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from 2100 mg per square meter of surface area per fraction of the waste stream per year to 8300 mg per square meter of surface area per fraction of the waste stream per year for landfills and 30000 mg per square meter of surface area per fraction of the waste stream per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to FORMIC ACID through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of FORMIC ACID that determine its movement and degredation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of the analysis procedure is contained in ~~Appendix A~~, Attachment 1.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of FORMIC ACID downstream from points of discharge in rivers is projected to be limited. Based on the analysis performed, approximately .82 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The potential for degradation or elimination of this compound from a river reach traversed in 5 days is high, with approximately 99 % of the total amount emitted. The projected amount of dissolved FORMIC ACID in a river reach traversed in 5 days is low, with approximately .82 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving FORMIC ACID is low. Concentration in the sediment may be 0.1 times as great as ambient water concentration. Based on the analysis performed, approximately .0000025 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving FORMIC ACID is low. Based on the analysis performed, approximately .00000024% of the amount emitted will be taken up by fish. Concentrations of FORMIC ACID in fish may be 0.2 times as great as dissolved concentrations. Virtually no releases from the rivers to the atmosphere should

occur.

Movement of FORMIC ACID through ponds and small reservoirs is projected to be limited. Based on the analysis performed, approximately 1.0 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The potential for degradation or elimination of this compound in such a pond is high with approximately 99 % of the total amount emitted. The projected amount of dissolved FORMIC ACID in a pond characterized by a retention time of 100 days is low, with approximately 1.0 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is low. Based on the analysis performed, approximately .00027 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 0.1 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving FORMIC ACID is low. Based on the analysis performed, approximately .00000004% of the amount emitted will be taken up by fish. Concentrations of FORMIC ACID in fish may be 0.2 times as great as dissolved concentrations. Virtually no releases from the ponds to the atmosphere should occur.

Movement of FORMIC ACID through reservoirs and lakes is projected to be limited. Based on the analysis performed, approximately .28 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The potential for degradation or elimination of this compound in such a reservoir or lake is high , with approximately 100 % of the total amount emitted. The projected amount of dissolved FORMIC ACID in a reservoir or lake characterized by a retention time of 365 days is low, with approximately 100 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is low. Concentration in the sediment may be 0.1 times as great as ambient water concentration. Based on the analysis performed, approximately .00029 % of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant FORMIC ACID loads is low. Based on the analysis performed, approximately .00000002% of the amount emitted will be taken up by fish. Concentrations of FORMIC ACID in fish may be 0.2 times as great as dissolved concentrations. Virtually no releases from the reservoirs or lakes to the atmosphere should occur.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- FORMIC ACID -----

Parameter	Value	Referen
Solubility (mg/l)	1000000	1
Ratio of molecular weights of FORMIC ACID to oxygen	1.4	2
Octanol/Water Partition Coefficient	.29	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	n.a.	
Microbial degradation rate constant (/days)	.96	4
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	.96	

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicate a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of FORMIC ACID

The following table provides examples of actual data, from chemical analysis, listed in EPA's Distribution Register of Organic Pollutants in Water (Water DROP) as described by Garrison et. al. (1979). Data are listed for only the categories raw drinking water, finished drinking water, surface water and well water.

Reported Observations of

Formic Acid

in Major Media Categories

Sample Description	Maximum Concentration Reported, (ug/l)	Reference
Surface water	31	1

1. Journal of the Water Pollution Control Federation
   37,410 (1965)

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Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-309.

Criteria Document prepared for Priority Pollutants per Section 307 of the Federal Water Pollution Control Act and the Clean Water Act as amended under contract for the U.S. EPA.

Compilation of solvent water partition coefficients as reported in the literature. Developed and maintained by Dr. Corlan Hansch, Pomona College, Pomona, California.

Verschueren, K. 1977. Handbook of Environmental Data on Organic Chemicals. Van Nostrand Reinhold Co., New York.

FUMARONITRILE

The potential release rates of FUMARONITRILE from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of FUMARONITRILE that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of FUMARONITRILE can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1.

FUMARONITRILE was found to be a contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from 4600 mg per square meter of surface area per fraction of the waste stream per year to 18000 mg per square meter of surface area per fraction of the waste stream per year for landfills and 68000 mg per square meter of surface area per fraction of the waste stream per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to FUMARONITRILE through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of FUMARONITRILE that determine its movement and degredation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of FUMARONITRILE downstream from points of discharge in rivers is projected to be significant. Based on the analysis performed, between 62 % and 74 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The potential for degradation or elimination of this compound from a river reach traversed in 5 days is significant, ranging from 26 % to 38 % of the total amount emitted. The projected amount of dissolved FUMARONITRILE in a river reach traversed in 5 days is significant, ranging from 62 % to 74 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving FUMARONITRILE is low. Concentration in the sediment may be 0.0 times as great as ambient water concentration. Based on the analysis performed, approximately .00010 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving FUMARONITRILE is low. Based on the analysis performed, approximately .00000055% of the amount emitted will be taken up by fish. Concentrations of FUMARONITRILE in fish may be 0.1 tires as great as dissolved concentrations. Estimated potential release to the atmosphere from a river reach traversed in 5 days (50 to 250 miles) is significant ranging from 4.8 % to 19 %.

Movement of FUMARONITRILE through ponds and small reservoirs is projected to be significant. Based on the analysis performed, approximately 16 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The potential for degradation or elimination of this compound in such a pond is high with approximately 83 % of the total amount emitted. The projected amount of dissolved FUMARONITRILE in a pond characterized by a retention time of 100 days is significant, with approximately 16 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is low. Based on the analysis performed, approximately .00012 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 0.0 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving FUMARONITRILE is low. Based on the analysis performed, approximately .00000040% of the amount emitted will be taken up by fish. Concentrations of FUMARONITRILE in fish may be 0.1 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a pond surface with a retention time of 100 days is low, with approximately 2.8 %.

Movement of FUMARONITRILE through reservoirs and lakes is projected to be limited. Based on the analysis performed, approximately 5.0 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The potential for degradation or elimination of this compound in such a reservoir or lake is high , with approximately 95 % of the total amount emitted. The projected amount of dissolved FUMARONITRILE in a reservoir or lake characterized by a retention time of 365 days is low, with approximately 95 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is low. Concentration in the sediment may be 0.0 times as great as ambient water concentration. Based on the analysis performed, approximately .00013 % of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant FUMARONITRILE loads is low. Based on the analysis performed, approximately .00000026% of the amount emitted will be taken up by fish. Concentrations of FUMARONITRILE in fish may be 0.1 times as great as dissolved concentrations. Estimated potential release from a reservoir or lake with an average retention time of 365 days is low with approximately 4.1 %.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- FUMARONITRILE -----

Parameter	Value	Referen
Solubility (mg/l)	1000000	1
Ratio of molecular weights of FUMARONITRILE to oxygen	2.4	2
Octanol/Water Partition Coefficient	.13	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	n.a.	
Microbial degradation rate constant (/days)	n.a.	
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	.048	4

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicate a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of FUMARONITRILE

Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-311.

Values of Kow based on Koc/solubility correlation developed by SRI International, J. H. Smith and D. C. Bomberger.

Values of Kow were calculated using a computer routine developed at SRI by Johnson and Leibrand (1980) which uses group values reported by Hansch and Leo (1979).

Mabey, W. R., Mill, T., Hendry, D. G., Chou, T., Johnson, H. L., Best Judgement. SRI International.

HEPTACHLOR

The potential release rates of HEPTACHLOR from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of HEPTACHLOR that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of HEPTACHLOR can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~.
Attachment 1.

HEPTACHLOR was found to be a contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from .075 mg per square meter of surface area per fraction of the waste stream per year to .30 mg per square meter of surface area per fraction of the waste stream per year for landfills and 1.1 mg per square meter of surface area per fraction of the waste stream per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to HEPTACHLOR through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of HEPTACHLOR that determine its movement and degradation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of the analysis procedure is contained in ~~Appendix A~~.
Attachment 1.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of HEPTACHLOR downstream from points of discharge in rivers is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The potential for degradation or elimination of this compound from a river reach traversed in 5 days is low, with approximately .00 % of the total amount emitted. The projected amount of dissolved HEPTACHLOR in a river reach traversed in 5 days is high, ranging from 50 % to 92 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving HEPTACHLOR is high. Concentration in the sediment may be 2000.0 times as great as ambient water concentration. Based on the analysis performed, between 7.7 % and 50 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving HEPTACHLOR is significant. Based on the analysis performed, approximately .00 % of the amount emitted will be taken up by fish. Concentrations of HEPTACHLOR in fish may be 499.1 times as great as dissolved concentrations. Virtually no releases from the rivers to the atmosphere should occur.

Movement of HEPTACHLOR through ponds and small reservoirs is projected to be widespread. Based on the analysis performed, between 51 % and 93 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The potential for degradation or elimination of this compound in such a pond is low with approximately .00000000% of the total amount emitted. The projected amount of dissolved HEPTACHLOR in a pond characterized by a retention time of 100 days is high, ranging from 50 % to 92 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is high. Based on the analysis performed, between 7.7 % and 50 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 2000.0 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving HEPTACHLOR is significant. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of HEPTACHLOR in fish may be 499.1 times as great as dissolved concentrations. Virtually no releases from the ponds to the atmosphere should occur.

Movement of HEPTACHLOR through reservoirs and lakes is projected to be widespread. Based on the analysis performed, between 50 % and 93 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The potential for degradation or elimination of this compound in such a reservoir or lake is low , with approximately .00000000% of the total amount emitted. The projected amount of dissolved HEPTACHLOR in a reservoir or lake characterized by a retention time of 365 days is high, ranging from .00000000% to .00000000% of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is high. Concentration in the sediment may be 2000.0 times as great as ambient water concentration. Based on the analysis performed, between 7.7 % and 50 % of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant HEPTACHLOR loads is significant. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of HEPTACHLOR in fish may be 499.1 times as great as dissolved concentrations. Virtually no releases from the reservoirs or lakes to the atmosphere should occur.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- HEPTACHLOR -----

Parameter	Value	Referen
Solubility (mg/l)	.056	1
Ratio of molecular weights of HEPTACHLOR to oxygen	12	2
Octanol/Water Partition Coefficient	8000	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	n.a.	
Microbial degradation rate constant (/days)	n.a.	
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	.00030	4

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicate a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of HEPTACHLOR

The following table provides examples of actual data, from chemical analysis, listed in EPA's Distribution Register of Organic Pollutants in Water (water DROP) as described by Garrison et, al, (1979). Data are listed for only the categories raw drinking water, finished drinking water, surface water and well water.

Reported Observations of

Heptachlor

in Major Media Categories

Sample Description	Maximum Concentration Reported, (ug/l)	Reference
Surface Water	0.04	1

1. Pesticide Monitoring Journal 3,124 (1969)

1 Chemical Week Pesticides Register.

2 Chemical Week Pesticides Register.

3 Values of Kow based on Koc/solubility correlation developed by SRI International, J. H. Smith and D. C. Bomberger.

4 Dave Pimentel, "Ecological Effects of Pesticides on Now-Target Species," Office of Science and Technology, Washington, D.C., 1971.

HEXACHLOROBENZENE

The potential release rates of HEXACHLOROBENZEN from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of HEXACHLOROBENZEN that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of HEXACHLOROBENZEN can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~, Attachment 1.

HEXACHLOROBENZEN was found to be the major contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from 5.3 mg per square meter of surface area per year to 21 mg per square meter of surface area per year for landfills and .00 mg per square meter of surface area per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters. HEXACHLOROBENZEN was found to be a contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from .0036 mg per square meter of surface area per fraction of the waste stream per year to .014 mg per square meter of surface area per fraction of the waste stream per year for landfills and .053 mg per square meter of surface area per fraction of the waste stream per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to HEXACHLOROBENZEN through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of HEXACHLOROBENZEN that determine its movement and degredation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of HEXACHLOROBENZEN downstream from points of discharge in rivers is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The potential for degradation or elimination of this compound from a river reach traversed in 5 days is low, with approximately .00 % of the total amount emitted. The projected amount of dissolved HEXACHLOROBENZEN in a river reach traversed in 5 days is significant, ranging from 4.5 % to 36 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving HEXACHLOROBENZEN is high. Concentration in the sediment may be 42000.0 times as great as ambient water concentration. Based on the analysis performed, between 64 % and 95 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving HEXACHLOROBENZEN is high. Based on the analysis performed, approximately .00 % of the amount emitted will be taken up by fish. Concentrations of HEXACHLOROBENZEN in fish may be 4895.9 times as great as dissolved concentrations. Virtually no releases from the rivers to the atmosphere should occur.

Movement of HEXACHLOROBENZEN through ponds and small reservoirs is projected to be significant. Based on the analysis performed, between 7.4 % and 43 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The potential for degradation or elimination of this compound in such a pond is low with approximately .00000000% of the total amount emitted. The projected amount of dissolved HEXACHLOROBENZEN in a pond characterized by a retention time of 100 days is significant, ranging from 4.5 % to 36 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is high. Based on the analysis performed, between 64 % and 95 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 42000.0 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving HEXACHLOROBENZEN is high. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of HEXACHLOROBENZEN in fish may be 4895.9 times as great as dissolved concentrations. Virtually no releases from the ponds to the atmosphere should occur.

Movement of HEXACHLOROBENZEN through reservoirs and lakes is projected to be significant. Based on the analysis performed, between 5.5 % and 39 %

of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The potential for degradation or elimination of this compound in such a reservoir or lake is low , with approximately .00000000% of the total amount emitted. The projected amount of dissolved HEXACHLOROBENZEN in a reservoir or lake characterized by a retention time of 365 days is significant, ranging from .00000000% to .00000000% of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is high. Concentration in the sediment may be 42000.0 times as great as ambient water concentration. Based on the analysis performed, between 64 % and 95 % of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant HEXACHLOROBENZEN loads is high. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of HEXACHLOROBENZEN in fish may be 4895.9 times as great as dissolved concentrations. Virtually no releases from the reservoirs or lakes to the atmosphere should occur.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- HEXACHLOROBENZEN -----

Parameter	Value	Referen
Solubility (mg/l)	.035	1
Ratio of molecular weights of HEXACHLOROBENZEN to oxygen	8.9	2
Octanol/Water Partition Coefficient	170000	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	n.a.	
Microbial degradation rate constant (/days)	n.a.	
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	.0010	4

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicate a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of HEXACHLOROBENZEN

The following table provides examples of actual data, from chemical analysis, listed in EPA's Distribution Register of Organic Pollutants in Water (Water DROP) as described by Garrison et. al. (1979). Data are listed for only the categories raw drinking water, finished drinking water, surface water and well water.

Reported Observations of

Hexachlorobenzene (also included in 51)

in Major Media Categories

Sample Description	Maximum Concentration Reported, (ug/l)	Reference
Surface Water	4	1

1. Monitoring To Detect Previously Unrecognized Pollutants In Surface Waters, Office of Toxic Substances, U.S. Environmental Protection Agency, Washington, D.C. 20460,EPA-560/6-77-015,July 1977, 375 pp, NTIS

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1 Dean, J. A., 1973. Lange's Handbook of Chemistry, McGraw-Hill Book Company, New York, N.Y.

2 Branson, P. R., "Predicting the Fate of Chemicals in the Aquatic Environment From Laboratory Data," in Estimating the Hazard of Chemical Substances to Aquatic Life, ASTM STP 657, J. Cairns, Jr., K. L. Kickson and A. W. Maki, Eds., 1978.

3 Kenaga, E. E. and C. A. I. Goring, "Relationship Between Water Solubility, Soil Sorption, Octanol-Water Partitioning, and Bioconcentration of Chemicals in Biota," ASTM Third Aquatic Toxicology Symposium, New Orleans, October 17 and 18, 1978.

4 "Classification by Degree of Hazard," Dow Chemical Co., submitted to U.S. EPA, July 16, 1979.

HEXACHLOROBUTADIENE

The potential release rates of HEXACHLOROBUTADIENE from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of HEXACHLOROBUTADIENE that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of HEXACHLOROBUTADIENE can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~.
Attachment 1.

HEXACHLOROBUTADIENE was found to be the major contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from .75 mg per square meter of surface area per year to 3.0 mg per square meter of surface area per year for landfills and .00 mg per square meter of surface area per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to HEXACHLOROBUTADIENE through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of HEXACHLOROBUTADIENE that determine its movement and degredation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of the analysis procedure is contained in ~~Appendix A~~.
Attachment 1.

Because no degradation data were available, the results of the analysis subsequently presented provides estimates of the relative partitioning only between air, water, and sediment media.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of HEXACHLOROBUTADIENE downstream from points of discharge in rivers is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The projected amount of dissolved HEXACHLOROBUTADIENE in a river reach traversed in 5 days is significant, ranging from 17 % to 70 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving HEXACHLOROBUTADIENE is high. Concentration in the sediment may be 10000.0 times as great as ambient water concentration. Based on the analysis performed, between 30 % and 83 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving HEXACHLOROBUTADIENE is high. Based on the analysis performed, approximately .00 % of the amount emitted will be taken up by fish. Concentrations of HEXACHLOROBUTADIENE in fish may be 1668.8 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a river reach traversed in 5 days (50 to 250 miles) is low with approximately .00 %.

Movement of HEXACHLOROBUTADIENE through ponds and small reservoirs is projected to be significant. Based on the analysis performed, between 19 % and 74 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The projected amount of dissolved HEXACHLOROBUTADIENE in a pond characterized by a retention time of 100 days is significant, ranging from 17 % to 70 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is high. Based on the analysis performed, between 30 % and 83 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 10000.0 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving HEXACHLOROBUTADIENE is high. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of HEXACHLOROBUTADIENE in fish may be 1668.8 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a pond surface with a retention time of 100 days is low, with approximately .00000000%.

Movement of HEXACHLOROBUTADIENE through reservoirs and lakes is projected to be significant. Based on the analysis performed, between 17 % and 72 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The projected amount of dissolved HEXACHLOROBUTADIENE in a reservoir or lake characterized by a retention time of 365 days is significant, ranging from .00000000% to .00000000% of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is high. Concentration in the sediment may be 10000.0 times as great as ambient water concentration. Based on the analysis performed, between 30 % and 83 % of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant HEXACHLOROBUTADIENE loads is high. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of HEXACHLOROBUTADIENE in fish may be 1668.8 times as great as dissolved concentrations. Estimated potential release from a reservoir or lake with an average retention time of 365 days is low with approximately .00000000%.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- HEXACHLOROBUTADIENE -----

Parameter	Value	Referen
Solubility (mg/l)	.0050	1
Ratio of molecular weights of HEXACHLOROBUTADIENE to oxygen	8.1	2
Octanol/Water Partition Coefficient	40000	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	n.a.	
Microbial degradation rate constant (/days)	n.a.	
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	n.a.	

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicates a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of HEXACHLOROBUTADIENE

The following table provides examples of actual data, from chemical analysis, listed in EPA's Distribution Register of Organic Pollutants in Water (Water DROP) as described by Garrison et. al. (1979). Data are listed for only the categories raw drinking water, finished drinking water, surface water and well water.

Reported Observations of

Hexachlorobutadiene

in Major Media Categories

Sample Description	Maximum Concentration Reported, (ug/l)	Reference
Drinking water, finished	0.7	1
Surface water	22	2

1. Analytical Report: New Orleans Area Water Supply Study; EPA 906/9-75-003 United States Environmental Protection Agency, Region VI, Dallas, TX, Dec.9, 1975, 95 pages, NTIS

2. Monitoring To Detect Previously Unrecognized Pollutants In Surface Waters, Office of Toxic Substances, U.S. Environmental Protection Agency, Washington, D.C. 20460,EPA-560/6-77-015,July 1977, 375 pp, NTIS

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1 Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-216.

2 EPA, 1980, "Hexachlorobutadiene: Hazard Profile," Center for Chemical Hazard Assessment, profile developed for Priority Pollutants (EPA).

3 Values of Kow based on Koc/solubility correlation developed by SRI International, J. H. Smith and D. C. Bomberger.

HEXACHLOROCYCLOPENTADIENE

The potential release rates of HEXACHLOROCYCLOPENTADIENE from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of HEXACHLOROCYCLOPENTADIENE that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of HEXACHLOROCYCLOPENTADIENE can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~.
Attachment 1.

HEXACHLOROCYCLOPENTADIENE was found to be the major contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be approximately .00 mg per square meter of surface area per year! for landfills and .00 mg per square meter of surface area per year for lagoons. Approximately .00 % of the material emitted from a landfill is estimated to reach surface waters. Approximately .00 % of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to HEXACHLOROCYCLOPENTADIENE through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of HEXACHLOROCYCLOPENTADIENE that determine its movement and degredation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of the analysis procedure is contained in

Attachment 1.
~~Appendix A~~.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of HEXACHLOROCYCLOPENTADIENE downstream from points of discharge in rivers is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The potential for degradation or elimination of this compound from a river reach traversed in 5 days is low, with approximately .00052 % of the total amount emitted. The projected amount of dissolved HEXACHLOROCYCLOPENTADIENE in a river reach traversed in 5 days is high, with approximately 99 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving HEXACHLOROCYCLOPENTADIENE is low. Concentration in the sediment may be 24.4 times as great as ambient water concentration. Based on the analysis performed, approximately .10 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving HEXACHLOROCYCLOPENTADIENE is low. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of HEXACHLOROCYCLOPENTADIENE in fish may be 18.3 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a river reach traversed in 5 days (50 to 250 miles) is low with approximately .00032 %.

Movement of HEXACHLOROCYCLOPENTADIENE through ponds and small reservoirs is projected to be widespread. Based on the analysis performed, approximately 99 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The potential for degradation or elimination of this compound in such a pond is low with approximately .00000000% of the total amount emitted. The projected amount of dissolved HEXACHLOROCYCLOPENTADIENE in a pond characterized by a retention time of 100 days is high, with approximately 99 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is low. Based on the analysis performed, approximately .10 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 24.4 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving HEXACHLOROCYCLOPENTADIENE is low. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of HEXACHLOROCYCLOPENTADIENE in fish may be 18.3 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a pond surface with a retention time of 100 days is low, with approximately .00000000%.

Movement of HEXACHLOROCYCLOPENTADIENE through reservoirs and lakes is projected to be widespread. Based on the analysis performed, approximately 99 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The potential for degradation or elimination of this compound in such a reservoir or lake is low , with approximately .00000000% of the total amount emitted. The projected amount of dissolved

HEXACHLOROCYCLOPENTADIENE in a reservoir or lake characterized by a retention time of 365 days is high, with approximately .00000000% of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is low. Concentration in the sediment may be 24.4 times as great as ambient water concentration. Based on the analysis performed, approximately .10 % of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant HEXACHLOROCYCLOPENTADIENE loads is low. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of HEXACHLOROCYCLOPENTADIENE in fish may be 18.3 times as great as dissolved concentrations. Estimated potential release from a reservoir or lake with an average retention time of 365 days is low with approximately .00000000%.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- HEXACHLOROCYCLOPENTADIENE -----

Parameter	Value	Referen
Solubility (mg/l)	27	1
Ratio of molecular weights of HEXACHLOROCYCLOPENTADIENE to oxygen	8.5	2
Octanol/Water Partition Coefficient	98	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	.048	4
Microbial degradation rate constant (/days)	n.a.	
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	.048	

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicate a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of HEXACHLOROCYCLOPENTADIENE

Verschueren, K. 1977. Handbook of Environmental Data on Organic Chemicals. Van Nostrand Reinhold Co., New York.

Chiou, C. T., U. H. Freed, D. W. Schmedding, and R. L. Kohnert, 1977, "Partition Coefficients and Bioaccumulation of Selected Organic Chemicals," Env. Sci. Technol., 11:475-478.

Values of Kow were calculated using a computer routine developed at SRI by Johnson and Leibrand (1980) which uses group values reported by Hansch and Leo (1979).

Zepp, R. G., N. L. Wolfe, G. L. Baughman, P. F. Schlotzhauer and J. N. MacAllister, 1979, Dynamics of Processes Influencing the Behavior of Hexachlorocyclopentadiene in The Aquatic Environment, U.S. EPA (ERL), Athens, GA. (Paper presented at Division of Environmental Chemistry, American Chemical Society, Washington, D.C., Sept. 9-14, 1979).

HEXACHLOROETHANE

The potential release rates of HEXACHLOROETHANE from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of HEXACHLOROETHANE that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of HEXACHLOROETHANE can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1.

HEXACHLOROETHANE was found to be a contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from 33 mg per square meter of surface area per fraction of the waste stream per year to 130 mg per square meter of surface area per fraction of the waste stream per year for landfills and 490 mg per square meter of surface area per fraction of the waste stream per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to HEXACHLOROETHANE through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of HEXACHLOROETHANE that determine its movement and degredation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of

the analysis procedure is contained in ~~Appendix A~~ Attachment 1. Because no degradation data were available, the results of the analysis subsequently presented provides estimates of the relative partitioning only between air, water, and sediment media.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of HEXACHLOROETHANE downstream from points of discharge in rivers is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The projected amount of dissolved HEXACHLOROETHANE in a river reach traversed in 5 days is high, with approximately 100 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving HEXACHLOROETHANE is low. Concentration in the sediment may be 4.5 times as great as ambient water concentration. Based on the analysis performed, approximately .019 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving HEXACHLOROETHANE is low. Based on the analysis performed, approximately ,00 % of the amount emitted will be taken up by fish. Concentrations of HEXACHLOROETHANE in fish may be 5.2 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a river reach traversed in 5 days (50 to 250 miles) is low with approximately ,00 %.

Movement of HEXACHLOROETHANE through ponds and small reservoirs is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The projected amount of dissolved HEXACHLOROETHANE in a pond characterized by a retention time of 100 days is high, with approximately 100 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is low. Based on the analysis performed, approximately .019 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 4.5 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving HEXACHLOROETHANE is low. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of HEXACHLOROETHANE in fish may be 5.2 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a pond surface with a retention time of 100 days is low, with approximately .00000000%.

Movement of HEXACHLOROETHANE through reservoirs and lakes is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The projected amount of dissolved HEXACHLOROETHANE in a reservoir or lake characterized by a retention time of 365 days is high, with approximately .00000000% of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is low. Concentration in the sediment may be 4.5 times as great as ambient water concentration. Based on the analysis performed, approximately .019 % of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant HEXACHLOROETHANE loads is low. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of HEXACHLOROETHANE in fish may be 5.2 times as great as dissolved concentrations. Estimated potential release from a reservoir or lake with an average retention time of 365 days is low with approximately .00000000%.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- HEXACHLOROETHANE -----

Parameter	Value	Referen
Solubility (mg/l)	50	1
Ratio of molecular weights of HEXACHLOROETHANE to oxygen	7.4	2
Octanol/Water Partition Coefficient	18	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	n.a.	
Microbial degradation rate constant (/days)	n.a.	
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	n.a.	

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicates a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of HEXACHLOROETHANE

The following table provides examples of actual data, from chemical analysis, listed in EPA's Distribution Register of Organic Pollutants in Water (Water DROP) as described by Garrison et, al, (1979), Data are listed for only the categories raw drinking water, finished drinking water, surface water and well water,

Reported Observations of

Hexachloroethane

in Major Media Categories

Sample Description	Maximum Concentration Reported, (ug/l)	Reference
Drinking water, finished	4.3	1
Surface water	3	2

1, Analytical Report; New Orleans Area Water Supply Study; EPA 906/9-75-003 United States Environmental Protection Agency, Region VI, Dallas, TX, Dec,9, 1975, 95 pages, NTIS

2, Monitoring To Detect Previously Unrecognized Pollutants In Surface Waters, Office of Toxic Substances, U,S, Environmental Protection Agency, Washington, D,C, 20460,EPA-560/6-77-015,July 1977, 375 pp, NTIS

1 Dean, J. A., 1973. Lange's Handbook of Chemistry, McGraw-Hill Book Company, New York, N.Y.

2 Neely, W. B., "Persistence Protocol Project," Workshop on Persistence for the National Research Council, Ottawa, Canada, April, 1978.

3 Values of Kow based on Koc/solubility correlation developed by SRI International, J. H. Smith and D. C. Bomberger.

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HEXACHLOROPHENE

The potential release rates of HEXACHLOROPHENE from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of HEXACHLOROPHENE that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of HEXACHLOROPHENE can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~ Attachment 1.

HEXACHLOROPHENE was found to be the major contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from .00060 mg per square meter of surface area per year to .0024 mg per square meter of surface area per year for landfills and .00 mg per square meter of surface area per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to HEXACHLOROPHENE through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of HEXACHLOROPHENE that determine its movement and degredation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of the analysis procedure is contained in ~~Appendix A~~ Attachment 1.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of HEXACHLOROPHENE downstream from points of discharge in rivers is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The potential for degradation or elimination of this compound from a river reach traversed in 5 days is low, with approximately .00 % of the total amount emitted. The projected amount of dissolved HEXACHLOROPHENE in a river reach traversed in 5 days is low, with approximately .023 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving HEXACHLOROPHENE is high. Concentration in the sediment may be 8750000.0 times as great as ambient water concentration. Based on the analysis performed, approximately 100 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving HEXACHLOROPHENE is high. Based on the analysis performed, approximately .00 % of the amount emitted will be taken up by fish. Concentrations of HEXACHLOPOPHENE in fish may be 268474.7 times as great as dissolved concentrations. Virtually no releases

Movement of HEXACHLOROPHENE through ponds and small reservoirs is projected to be significant. Based on the analysis performed, between 3.0 % and 11 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The potential for degradation or elimination of this compound in such a pond is low with approximately .00000000% of the total amount emitted. The projected amount of dissolved HEXACHLOROPHENE in a pond characterized by a retention time of 100 days is low, with approximately .023 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is high. Based on the analysis performed, approximately 100 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 8750000.0 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving HEXACHLOROPHENE is high. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of HEXACHLOROPHENE in fish may be 268474.7 times as great as dissolved concentrations. Virtually no releases from the ponds to the atmosphere should occur.

Movement of HEXACHLOROPHENE through reservoirs and lakes is projected to be limited. Based on the analysis performed, approximately 1.0 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The potential for degradation or elimination of this compound in such a reservoir or lake is low , with approximately .00000000% of the total amount emitted. The projected amount of dissolved HEXACHLOROPHENE in a reservoir or lake characterized by a retention time of 365 days is low, with approximately .00000000% of the total amount emitted.

from the rivers to the atmosphere should occur.

Movement of HEXACHLOROPHENE through ponds and small reservoirs is projected to be significant. Based on the analysis performed, between 3.0 % and 11 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The potential for degradation or elimination of this compound in such a pond is low with approximately .00000000% of the total amount emitted. The projected amount of dissolved HEXACHLOROPHENE in a pond characterized by a retention time of 100 days is low, with approximately .023 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is high. Based on the analysis performed, approximately 100 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 8750000.0 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving HEXACHLOROPHENE is high. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of HEXACHLOROPHENE in fish may be 268474.7 times as great as dissolved concentrations. Virtually no releases from the ponds to the atmosphere should occur.

Movement of HEXACHLOROPHENE through reservoirs and lakes is projected to be limited. Based on the analysis performed, approximately 1.0 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The potential for degradation or elimination of this compound in such a reservoir or lake is low , with approximately .00000000% of the total amount emitted. The projected amount of dissolved HEXACHLOROPHENE in a reservoir or lake characterized by a retention time of 365 days is low, with approximately .00000000% of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is high. Concentration in the sediment may be 8750000.0 times as great as ambient water concentration. Based on the analysis performed, approximately 100 % of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant HEXACHLOROPHENE loads is high. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of HEXACHLOROPHENE in fish may be 268474.7 times as great as dissolved concentrations. Virtually no releases from the reservoirs or lakes to the atmosphere should occur.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- HEXACHLOROPHENE -----

Parameter	Value	Referen
Solubility (mg/l)	.0000040	1
Ratio of molecular weights of HEXACHLOROPHENE to oxygen	13	2
Octanol/Water Partition Coefficient	35000000	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	n.a.	
Microbial degradation rate constant (/days)	n.a.	
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	.34	4
Overall degradation rate constant (/days)	.34	

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicate a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of HEXACHLOROPHENE

The following table provides examples of actual data, from chemical analysis, listed in EPA's Distribution Register of Organic Pollutants in Water (Water DROP) as described by Garrison et, al, (1979), Data are listed for only the categories raw drinking water, finished drinking water, surface water and well water.

Reported Observations of
Hexachlorophene
in Major Media Categories

Sample Description	Maximum Concentration Reported, (ug/l)	Reference
Drinking water, finished	0.01	1
Drinking water, unfinished	0.02	2
Surface water	12.1	3

1. Environmental Science Technology, 7,929 (1973)
2. Environmental Science Technology, 7, 929 (1973)
3. Environmental Science Technology, 7,929 (1973)

1 Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-372.

2 Chiou, C. T., U. H. Freed, D. W. Schmedding, and R. L. Kohnert, 1977, "Partition Coefficients and Bioaccumulation of Selected Organic Chemicals," Env. Sci. Technol., 11:475-478.

3 Values of Kow were calculated using a computer routine developed at SRI by Johnson and Leibrand (1980) which uses group values reported by Hansch and Leo (1979).

4 Howard, J. A. and E. Furimsky, 1973. Arrhenius Parameters for Reaction of tert-Butylperoxy Radicals with Some Hindered Phenols and Aromatic Amines. Can. J. Chem. 51:3738.

HYDROFLUORIC ACID

The potential release rates of HYDROFLUORIC ACID from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of HYDROFLUORIC ACID that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of HYDROFLUORIC ACID can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1.

HYDROFLUORIC ACID was found to be a contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from 600 mg per square meter of surface area per fraction of the waste stream per year to 2400 mg per square meter of surface area per fraction of the waste stream per year for landfills and 8800 mg per square meter of surface area per fraction of the waste stream per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to HYDROFLUORIC ACID through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of HYDROFLUORIC ACID that determine its movement and degradation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of

the analysis procedure is contained in ~~Appendix A~~ Attachment 1. Because no degradation data were available, the results of the analysis subsequently presented provides estimates of the relative partitioning only between air, water, and sediment media.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of HYDROFLUORIC ACID downstream from points of discharge in rivers is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The projected amount of dissolved HYDROFLUORIC ACID in a river reach traversed in 5 days is high, with approximately 100 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving HYDROFLUORIC ACID is low. Concentration in the sediment may be 0.2 times as great as ambient water concentration. Based on the analysis performed, approximately .0010 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving HYDROFLUORIC ACID is low. Based on the

Page 333 has been left intentionally blank analysis performed, approximately .00 % of the amount emitted will be taken up by fish. Concentrations of HYDROFLUORIC ACID in fish may be 0.6 times as great as dissolved concentrations. Virtually no releases from the rivers to the atmosphere should occur.

Movement of HYDROFLUORIC ACID through ponds and small reservoirs is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The projected amount of dissolved HYDROFLUORIC ACID in a pond characterized by a retention time of 100 days is high, with approximately 100 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is low. Based on the analysis performed, approximately .0010 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 0.2 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving HYDROFLUORIC ACID is low. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of HYDROFLUORIC ACID in fish may be 0.6 times as great as dissolved concentrations. Virtually no releases from the ponds to the atmosphere should occur.

Movement of HYDROFLUORIC ACID through reservoirs and lakes is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The projected amount of dissolved HYDROFLUORIC ACID in a reservoir or lake characterized by a retention time of 365 days is high, with approximately .00000000% of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is low. Concentration in the sediment may be 0.2 times as great as ambient water concentration. Based on the analysis performed, approximately .0010 % of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant HYDROFLUORIC ACID loads is low. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of HYDROFLUORIC ACID in fish may be 0.6 times as great as dissolved concentrations. Virtually no releases from the reservoirs or lakes to the atmosphere should occur.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- HYDROFLUORIC ACID -----

Parameter	Value	Referen
Solubility (mg/l)	1000000	1
Ratio of molecular weights of HYDROFLUORIC ACID to oxygen	.62	2
Octanol/Water Partition Coefficient	1.0	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	n.a.	
Microbial degradation rate constant (/days)	n.a.	
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	n.a.	

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicates a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of HYDROFLUORIC ACID

1 Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. B-123.

2 Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by the U.S. EPA.

3 Best Judgement by J. W. Falco, EPA-ERL, Athens, GA.

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HYDROCYANIC ACID

The potential release rates of HYDROCYANIC ACID from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of HYDROCYANIC ACID that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of HYDROCYANIC ACID can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1.

HYDROCYANIC ACID was found to be a contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from 1100 mg per square meter of surface area per fraction of the waste stream per year to 4300 mg per square meter of surface area per fraction of the waste stream per year for landfills and 16000 mg per square meter of surface area per fraction of the waste stream per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to HYDROCYANIC ACID through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of HYDROCYANIC ACID that determine its movement and degredation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of

the analysis procedure is contained in ~~Appendix A~~ Attachment 1. Because no degradation data were available, the results of the analysis subsequently presented provides estimates of the relative partitioning only between air, water, and sediment media.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of HYDROCYANIC ACID downstream from points of discharge in rivers is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The projected amount of dissolved HYDROCYANIC ACID in a river reach traversed in 5 days is high, with approximately 100 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving HYDROCYANIC ACID is low. Concentration in the sediment may be 0.1 times as great as ambient water concentration. Based on the analysis performed, approximately .00059 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving HYDROCYANIC ACID is low. Based on the analysis performed, approximately .00 % of the amount emitted will be taken up by fish. Concentrations of HYDROCYANIC ACID in fish may be 0.4 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a river reach traversed in 5 days (50 to 250 miles) is low with approximately .00 %.

Movement of HYDROCYANIC ACID through ponds and small reservoirs is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The projected amount of dissolved HYDROCYANIC ACID in a pond characterized by a retention time of 100 days is high, with approximately 100 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is low. Based on the analysis performed, approximately .00059 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 0.1 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving HYDROCYANIC ACID is low. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of HYDROCYANIC ACID in fish may be 0.4 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a pond surface with a retention time of 100 days is low, with approximately .00000000%.

Movement of HYDROCYANIC ACID through reservoirs and lakes is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The projected amount of dissolved HYDROCYANIC ACID in a reservoir or lake characterized by a retention time of 365 days is high, with approximately .00000000% of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is low. Concentration in the sediment may be 0.1 times as great as ambient water concentration. Based on the analysis performed, approximately .00059 % of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant HYDROCYANIC ACID loads is low. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of HYDROCYANIC ACID in fish may be 0.4 times as great as dissolved concentrations. Estimated potential release from a reservoir or lake with an average retention time of 365 days is low with approximately .00000000%.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- HYDROCYANIC ACID -----

Parameter	Value	Referen
Solubility (mg/l)	1000000	1
Ratio of molecular weights of HYDROCYANIC ACID to oxygen	.84	2
Octanol/water Partition Coefficient	.56	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	n.a.	
Microbial degradation rate constant (/days)	n.a.	
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	n.a.	

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicates a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of HYDROCYANIC ACID

1 Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. B-123.

2 Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by the U.S. EPA.

3 Dawson, G. W., English, C. J., Petty, S. E., Best estimate by Battelle Northwest.

LEAD

The potential release rates of LEAD from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of LEAD that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of LEAD can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1.

LEAD was found to be the major contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from 1.5 mg per square meter of surface area per year to 6.0 mg per square meter of surface area per year for landfills and .00 mg per square meter of surface area per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to LEAD through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of LEAD that determine its movement and degradation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1. Because no degradation data were available, the results of the analysis subsequently presented provides estimates of the relative partitioning only between air, water, and sediment media.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of LEAD downstream from points of discharge in rivers is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The projected amount of dissolved LEAD in a river reach traversed in 5 days is high, ranging from 29 % to 83 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving LEAD is high. Concentration in the sediment may be 5000.0 times as great as ambient water concentration. Based on the analysis performed, between 17 % and 71 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving LEAD is significant. Based on the analysis performed, approximately .00 % of the amount emitted will be taken up by fish. Concentrations of LEAD in fish may be 992.3 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a river reach traversed in 5 days (50 to 250 miles) is low with approximately .00 %.

Movement of LEAD through ponds and small reservoirs is projected to be widespread. Based on the analysis performed, between 31 % and 85 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The projected amount of dissolved LEAD in a pond characterized by a retention time of 100 days is high, ranging from 29 % to 83 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is high. Based on the analysis performed, between 17 % and 71 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 5000.0 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving LEAD is significant. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of LEAD in fish may be 992.3 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a pond surface with a retention time of 100 days is low, with approximately .00000000%.

Movement of LEAD through reservoirs and lakes is projected to be widespread. Based on the analysis performed, between 29 % and 84 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The projected amount of dissolved LEAD in a reservoir or lake characterized by a retention time of 365 days is high, ranging from .00000000% to .00000000% of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is high. Concentration in the sediment may be 5000.0 times as great as ambient water concentration. Based on the analysis performed, between 17 % and 71 % of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant LEAD loads is significant. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of LEAD in fish may be 992.3 times as great as dissolved concentrations. Estimated potential release from a reservoir or lake with an average retention time of 365 days is low with approximately .00000000%.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- LEAD -----

Parameter	Value	Referen
Solubility (mg/l)	.010	1
Ratio of molecular weights of LEAD to oxygen	6.5	2
Octanol/water Partition Coefficient	20000	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	n.a.	
Microbial degradation rate constant (/days)	n.a.	
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	n.a.	

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicates a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of LEAD

1 Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. B-128.

2 Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by the U.S. EPA.

3 Values of Kow based on Koc/solubility correlation developed by SRI International, J. H. Smith and D. C. Bomberger.

MALEIC ANHYDRIDE

The potential release rates of MALEIC ANHYDRIDE from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of MALEIC ANHYDRIDE that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of MALEIC ANHYDRIDE can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~ Attachment 1.

MALEIC ANHYDRIDE was found to be a contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from 2300 mg per square meter of surface area per fraction of the waste stream per year to 9200 mg per square meter of surface area per fraction of the waste stream per year for landfills and 34000 mg per square meter of surface area per fraction of the waste stream per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to MALEIC ANHYDRIDE through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of MALEIC ANHYDRIDE that determine its movement and degredation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of

the analysis procedure is contained in ~~Appendix A~~ Attachment 1.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of MALEIC ANHYDRIDE downstream from points of discharge in rivers is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The potential for degradation or elimination of this compound from a river reach traversed in 5 days is low, with approximately .00 % of the total amount emitted. The projected amount of dissolved MALEIC ANHYDRIDE in a river reach traversed in 5 days is high, with approximately 100 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving MALEIC ANHYDRIDE is low. Concentration in the sediment may be 0.1 times as great as ambient water concentration. Based on the analysis performed, approximately .00027 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving MALEIC ANHYDRIDE is low. Based on the analysis performed, approximately .00 % of the amount emitted will be taken up by fish. Concentrations of MALEIC ANHYDRIDE in fish may be 0.2 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a river reach traversed in 5 days (50 to 250 miles) is low with approximately .00 %.

Movement of MALEIC ANHYDRIDE through ponds and small reservoirs is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The potential for degradation or elimination of this compound in such a pond is low with approximately .0000062 % of the total amount emitted. The projected amount of dissolved MALEIC ANHYDRIDE in a pond characterized by a retention time of 100 days is high, with approximately 100 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is low. Based on the analysis performed, approximately .00027 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 0.1 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving MALEIC ANHYDRIDE is low. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of MALEIC ANHYDRIDE in fish may be 0.2 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a pond surface with a retention time of 100 days is low, with approximately .0000013 %.

Movement of MALEIC ANHYDRIDE through reservoirs and lakes is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The potential for degradation or elimination of this compound in such a reservoir or lake is low , with approximately .00000000% of the total amount emitted. The projected amount of dissolved MALEIC ANHYDRIDE in a reservoir or lake characterized by a retention time of 365 days is high, with approximately .00000000% of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is low. Concentration in the sediment may be 0.1 times as great as ambient water concentration. Based on the analysis performed, approximately .00027 % of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant MALEIC ANHYDRIDE loads is low. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of MALEIC ANHYDRIDE in fish may be 0.2 times as great as dissolved concentrations. Estimated potential release from a reservoir or lake with an average retention time of 365 days is low with approximately .00000000%.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- MALEIC ANHYDRIDE -----

Parameter	Value	Referen
Solubility (mg/l)	160000	1
Ratio of molecular weights of MALEIC ANHYDRIDE to oxygen	3.1	2
Octanol/Water Partition Coefficient	.26	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	n.a.	
Microbial degradation rate constant (/days)	.072	4
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	.072	

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicate a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of MALEIC ANHYDRIDE

1 "Chemical Hazards Response Information Service (CHRIS); Hazardous Chemical Data," CG-446-2, U.S. Coast Guard, 1974.

2 Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by the U.S. EPA.

3 Dawson, G. W., English, C. J., Petty, S. E., Best estimate by Battelle Northwest.

4 Mabey, W. R., Mill, T., Hendry, D. G., Chou, T., Johnson, H. L., Best Judgement. SRI International.

MALEONITRILE

The potential release rates of MALEONITRILE from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of MALEONITRILE that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of MALEONITRILE can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1.

MALEONITRILE was found to be a contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from 4600 mg per square meter of surface area per fraction of the waste stream per year to 18000 mg per square meter of surface area per fraction of the waste stream per year for landfills and 68000 mg per square meter of surface area per fraction of the waste stream per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to MALEONITRILE through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of MALEONITRILE that determine its movement and degradation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of MALEONITRILE downstream from points of discharge in rivers is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The potential for degradation or elimination of this compound from a river reach traversed in 5 days is low, with approximately .00 % of the total amount emitted. The projected amount of dissolved MALEONITRILE in a river reach traversed in 5 days is high, with approximately 100 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving MALEONITRILE is low. Concentration in the sediment may be 0.0 times as great as ambient water concentration. Based on the analysis performed, approximately .00014 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving MALEONITRILE is low. Based on the analysis performed, approximately .00 % of the amount emitted will be taken up by fish. Concentrations of MALEONITRILE in fish may be 0.1 times as great as dissolved concentrations. Virtually no releases from the rivers to the atmosphere should

occur.

Movement of MALEONITRILE through ponds and small reservoirs is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The potential for degradation or elimination of this compound in such a pond is low with approximately .0000066 % of the total amount emitted. The projected amount of dissolved MALEONITRILE in a pond characterized by a retention time of 100 days is high, with approximately 100 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is low. Based on the analysis performed, approximately .00014 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 0.0 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving MALEONITRILE is low. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of MALEONITRILE in fish may be 0.1 times as great as dissolved concentrations. Virtually no releases from the ponds to the atmosphere should occur.

Movement of MALEONITRILE through reservoirs and lakes is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The potential for degradation or elimination of this compound in such a reservoir or lake is low , with approximately .00000000% of the total amount emitted. The projected amount of dissolved MALEONITRILE in a reservoir or lake characterized by a retention time of 365 days is high, with approximately .00000000% of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is low. Concentration in the sediment may be 0.0 times as great as ambient water concentration. Based on the analysis performed, approximately .00014 % of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant MALEONITRILE loads is low. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of MALEONITRILE in fish may be 0.1 times as great as dissolved concentrations. Virtually no releases from the reservoirs or lakes to the atmosphere should occur.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- - . MALEONITRILE -----

Parameter	Value	Referen
Solubility (mg/l)	1000000	1
Ratio of molecular weights of MALEONITRILE to oxygen	2.4	2
Octanol/Water Partition Coefficient	.13	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	n.a.	
Microbial degradation rate constant (/days)	.096	4
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	.096	

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicate a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of MALEONITRILE

Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-311.

Chiou, C. T., U. H. Freed, D. W. Schmedding, and R. L. Kohnert, 1977, "Partition Coefficients and Bioaccumulation of Selected Organic Chemicals," Env. Sci. Technol., 11:475-478.

Values of Kow were calculated using a computer routine developed at SRI by Johnson and Leibrand (1980) which uses group values reported by Hansch and Leo (1979).

Verschueren, K. 1977. Handbook of Environmental Data on Organic Chemicals. Van Nostrand Reinhold Co., New York.

methyl

METHANOL

The potential release rates of METHANOL from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of METHANOL that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of METHANOL can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~ Attachment 1.

METHANOL was found to be a contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from 3400 mg per square meter of surface area per fraction of the waste stream per year to 14000 mg per square meter of surface area per fraction of the waste stream per year for landfills and 50000 mg per square meter of surface area per fraction of the waste stream per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to METHANOL through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of METHANOL that determine its movement and degradation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of the analysis procedure is contained in ~~Appendix A~~ Attachment 1.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of METHANOL downstream from points of discharge in rivers is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The potential for degradation or elimination of this compound from a river reach traversed in 5 days is low, with approximately .00 % of the total amount emitted. The projected amount of dissolved METHANOL in a river reach traversed in 5 days is high, with approximately 100 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving METHANOL is low. Concentration in the sediment may be 0.0 times as great as ambient water concentration. Based on the analysis performed, approximately .00019 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving METHANOL is low. Based on the analysis performed, approximately .00 % of the amount emitted will be taken up by fish. Concentrations of METHANOL in fish may be 0.2 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a river reach traversed in 5 days (50 to 250 miles) is low with approximately .00 %.

Movement of METHANOL through ponds and small reservoirs is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The potential for degradation or elimination of this compound in such a pond is low with approximately .0000085 % of the total amount emitted. The projected amount of dissolved METHANOL in a pond characterized by a retention time of 100 days is high, with approximately 100 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is low. Based on the analysis performed, approximately .00019 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 0.0 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving METHANOL is low. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of METHANOL in fish may be 0.2 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a pond surface with a retention time of 100 days is low, with approximately .00000055%.

Movement of METHANOL through reservoirs and lakes is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The potential for degradation or elimination of this compound in such a reservoir or lake is low , with approximately .00000000% of the total amount emitted. The projected amount of dissolved METHANOL in a reservoir or lake characterized by a retention time of 365 days is high, with approximately .00000000% of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is low. Concentration in the sediment may be 0.0 times as great as ambient water concentration. Based on the

analysis performed, approximately .00019 % of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant METHANOL loads is low. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of METHANOL in fish may be 0.2 times as great as dissolved concentrations. Estimated potential release from a reservoir or lake with an average retention time of 365 days is low with approximately .00000000%.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

365

----- METHANOL -----

Parameter	Value	Referen
Solubility (mg/l)	1000000	1
Ratio of molecular weights of METHANOL to oxygen	1.0	2
Octanol/water Partition Coefficient	.18	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	n.a.	
Microbial degradation rate constant (/days)	n.a.	
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	.48	4

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicate a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of METHANOL

1 Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-376.

2 Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by the U.S. EPA.

3 Values of Kow were calculated using a computer routine developed at SRI by Johnson and Leibrand (1980) which uses group values reported by Hansch and Leo (1979).

4 Hatfield, R., 1957, Biological Oxidation of Some Organic Compounds, Ind. Eng. Chem. 49:192-196.

METHOMYL

The potential release rates of METHOMYL from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of METHOMYL that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of METHOMYL can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~ Attachment 1.

METHOMYL was found to be a contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from 300 mg per square meter of surface area per fraction of the waste stream per year to 1200 mg per square meter of surface area per fraction of the waste stream per year for landfills and 4400 mg per square meter of surface area per fraction of the waste stream per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to METHOMYL through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of METHOMYL that determine its movement and degradation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of METHOMYL downstream from points of discharge in rivers is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The potential for degradation or elimination of this compound from a river reach traversed in 5 days is low, with approximately .00 % of the total amount emitted. The projected amount of dissolved METHOMYL in a river reach traversed in 5 days is high, with approximately 100 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving METHOMYL is low. Concentration in the sediment may be 0.5 times as great as ambient water concentration. Based on the analysis performed, approximately .0021 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving METHOMYL is low. Based on the analysis performed, approximately .00 % of the amount emitted will be taken up by fish. Concentrations of METHOMYL in fish may be 1.0 times as great as dissolved concentrations. Virtually no releases from the rivers to the atmosphere should occur.

Movement of METHOMYL through ponds and small reservoirs is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The potential for degradation or elimination of this compound in such a pond is low with approximately .000039 % of the total amount emitted. The projected amount of dissolved METHOMYL in a pond characterized by a retention time of 100 days is high, with approximately 100 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is low. Based on the analysis performed, approximately .0021 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 0.5 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving METHOMYL is low. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of METHOMYL in fish may be 1.0 times as great as dissolved concentrations. Virtually no releases from the ponds to the atmosphere should occur.

Movement of METHOMYL through reservoirs and lakes is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The potential for degradation or elimination of this compound in such a reservoir or lake is low , with approximately .00000000% of the total amount emitted. The projected amount of dissolved METHOMYL in a reservoir or lake characterized by a retention time of 365 days is high, with approximately .00000000% of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is low. Concentration in the sediment may be 0.5 times as great as ambient water concentration. Based on the analysis performed, approximately .0021 % of the amount

emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant METHOMYL loads is low. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of METHOMYL in fish may be 1.0 times as great as dissolved concentrations. Virtually no releases from the reservoirs or lakes to the atmosphere should occur.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- METHOMYL -----

Parameter	Value	Referen
Solubility (mg/l)	58000	1
Ratio of molecular weights of METHOMYL to oxygen	5.1	2
Octanol/water Partition Coefficient	2.0	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	n.a.	
Microbial degradation rate constant (/days)	n.a.	
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	.14	4

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicate a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of METHOMYL

1 Chemical Week Pesticides Register.

2 Mabey, W. R., Mill, T., Hendry, D. G., Chou, T., Johnson, H. L., Best Judgement. SRI International.

3 Kenaga, E. E. and C. A. I. Goring, "Relationship Between Water Solubility, Soil Sorption, Octanol-Water Partitioning, and Bioconcentration of Chemicals in Biota," ASTM Third Aquatic Toxicology Symposium, New Orleans, October 17 and 18, 1978.

4 Mabey, W. R., Mill, T., Hendry, D. G., Chou, T., Johnson, H. L., Best Judgement. SRI International.

METHYL CHLORIDE

The potential release rates of METHYL CHLORIDE from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of METHYL CHLORIDE that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of METHYL CHLORIDE can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~ Attachment 1.

METHYL CHLORIDE was found to be a contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from 74 mg per square meter of surface area per fraction of the waste stream per year to 300 mg per square meter of surface area per fraction of the waste stream per year for landfills and 1100 mg per square meter of surface area per fraction of the waste stream per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to METHYL CHLORIDE through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of METHYL CHLORIDE that determine its movement and degredation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of

the analysis procedure is contained in ~~Appendix A~~ Attachment 1. Because no degradation data were available, the results of the analysis subsequently presented provides estimates of the relative partitioning only between air, water, and sediment media.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of METHYL CHLORIDE downstream from points of discharge in rivers is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The projected amount of dissolved METHYL CHLORIDE in a river reach traversed in 5 days is high, with approximately 100 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving METHYL CHLORIDE is low. Concentration in the sediment may be 2.0 times as great as ambient water concentration. Based on the analysis performed, approximately .0085 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving METHYL CHLORIDE is low. Based on the analysis performed, the analysis procedure is contained in Appendix A. Because no degradation data were available, the results of the analysis subsequently presented provides estimates of the relative partitioning only between air, water, and sediment media.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of METHYLENE CHLORIDE downstream from points of discharge in rivers is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The projected amount of dissolved METHYLENE CHLORIDE in a river reach traversed in 5 days is high, with approximately 100 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving METHYLENE CHLORIDE is low. Concentration in the sediment may be 5.0 times as great as ambient water concentration. Based on the analysis performed, approximately .021 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving METHYLENE CHLORIDE is low. Based on the approximately .00 % of the amount emitted will be taken up by fish. Concentrations of METHYL CHLORIDE in fish may be 2.8 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a river reach traversed in 5 days (50 to 250 miles) is low with approximately .00 %.

Movement of METHYL CHLORIDE through ponds and small reservoirs is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The projected amount of dissolved METHYL CHLORIDE in a pond characterized by a retention time of 100 days is high, with approximately 100 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is low. Based on the analysis performed, approximately .0085 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 2.0 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving METHYL CHLORIDE is low. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of METHYL CHLORIDE in fish may be 2.8 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a pond surface with a retention time of 100 days is low, with approximately .0000072 %.

Movement of METHYL CHLORIDE through reservoirs and lakes is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The projected amount of dissolved METHYL CHLORIDE in a reservoir or lake characterized by a retention time of 365 days is high, with approximately .00000000% of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is low. Concentration in the sediment may be 2.0 times as great as ambient water concentration. Based on the analysis performed, approximately .0085 % of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant METHYL CHLORIDE loads is low. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of METHYL CHLORIDE in fish may be 2.8 times as great as dissolved concentrations. Estimated potential release from a reservoir or lake with an average retention time of 365 days is low with approximately .00000000%.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- METHYL CHLORIDE -----

Parameter	Value	Referen
Solubility (mg/l)	400	1
Ratio of molecular weights of METHYL CHLORIDE to oxygen	1.6	2
Octanol/Water Partition Coefficient	8.1	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	n.a.	
Microbial degradation rate constant (/days)	n.a.	
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	n.a.	

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicates a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of METHYL CHLORIDE

"Chemical Hazards Response Information Service (CHRIS); Hazardous Chemical Data," CG-446-2, U.S. Coast Guard, 1974.

Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by the U.S. EPA.

Compilation of solvent water partition coefficients as reported in the literature. Developed and maintained by Dr. Corlan Hansch, Pomona College, Pomona, California.

METHYLENE CHLORIDE

The potential release rates of METHYLENE CHLORIDE from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of METHYLENE CHLORIDE that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of METHYLENE CHLORIDE can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1.

METHYLENE CHLORIDE was found to be a contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from 30 mg per square meter of surface area per fraction of the waste stream per year to 120 mg per square meter of surface area per fraction of the waste stream per year for landfills and 440 mg per square meter of surface area per fraction of the waste stream per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to METHYLENE CHLORIDE through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of METHYLENE CHLORIDE that determine its movement and degredation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of

the analysis procedure is contained in ~~Appendix A~~ Attachment 1. Because no degradation data were available, the results of the analysis subsequently presented provides estimates of the relative partitioning only between air, water, and sediment media.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of METHYLENE CHLORIDE downstream from points of discharge in rivers is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The projected amount of dissolved METHYLENE CHLORIDE in a river reach traversed in 5 days is high, with approximately 100 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving METHYLENE CHLORIDE is low. Concentration in the sediment may be 5.0 times as great as ambient water concentration. Based on the analysis performed, approximately .021 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving METHYLENE CHLORIDE is low. Based on the analysis performed, approximately .00 % of the amount emitted will be taken up by fish. Concentrations of METHYLENE CHLORIDE in fish may be 5.6 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a river reach traversed in 5 days (50 to 250 miles) is low with approximately .00 %.

Movement of METHYLENE CHLORIDE through ponds and small reservoirs is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The projected amount of dissolved METHYLENE CHLORIDE in a pond characterized by a retention time of 100 days is high, with approximately 100 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is low. Based on the analysis performed, approximately .021 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 5.0 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving METHYLENE CHLORIDE is low. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of METHYLENE CHLORIDE in fish may be 5.6 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a pond surface with a retention time of 100 days is low, with approximately .0000055 %.

Movement of METHYLENE CHLORIDE through reservoirs and lakes is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The projected amount of dissolved METHYLENE CHLORIDE in a reservoir or lake characterized by a retention time of 365 days is high, with approximately .00000000% of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is low. Concentration in the sediment may be 5.0 times as great as ambient water concentration. Based on the analysis performed, approximately .021 % of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant METHYLENE CHLORIDE loads is low. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of METHYLENE CHLORIDE in fish may be 5.6 times as great as dissolved concentrations. Estimated potential release from a reservoir or lake with an average retention time of 365 days is low with approximately .00000000%.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- METHYLENE CHLORIDE -----

Parameter	Value	Referen
Solubility (mg/l)	20000	1
Ratio of molecular weights of METHYLENE CHLORIDE to oxygen	2.7	2
Octanol/Water Partition Coefficient	20	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	n.a.	
Microbial degradation rate constant (/days)	n.a.	
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	n.a.	

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicates a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of METHYLENE CHLORIDE

The following table provides examples of actual data, from chemical analysis, listed in EPA's Distribution Register of Organic Pollutants in Water (Water DROP) as described by Garrison et. al. (1979). Data are listed for only the categories raw drinking water, finished drinking water, surface water and well water.

Reported Observations of

Methylene Chloride

in Major Media Categories

Sample Description	Maximum Concentration Reported, (ug/l)	Reference
Drinking water, finished	3.0	1
Surface water	30	2
Well water	1000	3

1. Monitoring To Detect Previously Unrecognized Pollutants In Surface Waters, Office of Toxic Substances, U.S. Environmental Protection Agency, Washington, D.C. 20460,EPA-560/6-77-015, July 1977, 375 pp, NTIS

2. Monitoring To Detect Previously Unrecognized Pollutants In Surface Waters, Office of Toxic Substances, U.S. Environmental Protection Agency, Washington, D.C. 20460,EPA-560/6-77-015, July 1977, 375 pp, NTIS

3. Personal Communication: E.W. Loy, Jr., (EPA, Reg. IV, Athens, GA) to G. Junk, June 16, 1975; Subject: Orange County, Florida, Taste and Odor Episode.

1 Fazzalari, F. A., Editor, 1978, Compilation of Odor and Taste Threshold Values Data, American Society for Testing and Materials, Philadelphia, PA.

2 Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by the U.S. EPA.

3 Daniels, S. L., W. B. Neely, and R. E. Bailey, "Toxic 'Priority' Pollutant Perspectives," Environmental Sciences Reserch, Dow Chemical Company, May 9, 1979.

METHYL METHACRYLATE

The potential release rates of METHYL METHACRYLATE from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of METHYL METHACRYLATE that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of METHYL METHACRYLATE can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~ Attachment 1.

METHYL METHACRYLATE was found to be a contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from 97 mg per square meter of surface area per fraction of the waste stream per year to 390 mg per square meter of surface area per fraction of the waste stream per year for landfills and 1400 mg per square meter of surface area per fraction of the waste stream per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to METHYL METHACRYLATE through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of METHYL METHACRYLATE that determine its movement and degradation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of

the analysis procedure is contained in ~~Appendix A~~ Attachment 1.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of METHYL METHACRYLATE downstream from points of discharge in rivers is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The potential for degradation or elimination of this compound from a river reach traversed in 5 days is low, with approximately .00 % of the total amount emitted. The projected amount of dissolved METHYL METHACRYLATE in a river reach traversed in 5 days is high, with approximately 100 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving METHYL METHACRYLATE is low. Concentration in the sediment may be 1.5 times as great as ambient water concentration. Based on the analysis performed, approximately .0065 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving METHYL METHACRYLATE is low. Based on the analysis performed, approximately .00 % of the amount emitted will be taken up by fish. Concentrations of METHYL METHACRYLATE in fish may be 2.3 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a river reach traversed in 5 days (50 to 250 miles) is low with approximately .00 %.

Movement of METHYL METHACRYLATE through ponds and small reservoirs is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The potential for degradation or elimination of this compound in such a pond is low with approximately .000020 % of the total amount emitted. The projected amount of dissolved METHYL METHACRYLATE in a pond characterized by a retention time of 100 days is high, with approximately 100 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is low. Based on the analysis performed, approximately .0065 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 1.5 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving METHYL METHACRYLATE is low. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of METHYL METHACRYLATE in fish may be 2.3 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a pond surface with a retention time of 100 days is low, with approximately .0000068%.

Movement of METHYL METHACRYLATE through reservoirs and lakes is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The potential for degradation or elimination of this compound in such a reservoir or lake is low , with approximately .00000000% of the total amount emitted. The projected amount of dissolved METHYL METHACRYLATE in a reservoir or lake characterized by a retention time of 365 days is high, with approximately .00000000% of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is low. Concentration in the sediment may be 1.5 times as great as ambient water concentration. Based on the analysis performed, approximately .0065 % of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant METHYL METHACRYLATE loads is low. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of METHYL METHACRYLATE in fish may be 2.3 times as great as dissolved concentrations. Estimated potential release from a reservoir or lake with an average retention time of 365 days is low with approximately .00000000%.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- METHYL METHACRYLATE -----

Parameter	Value	Referen
Solubility (mg/l)	20	1
Ratio of molecular weights of METHYL METHACRYLATE to oxygen	3.1	2
Octanol/Water Partition Coefficient	6.2	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	n.a.	
Microbial degradation rate constant (/days)	n.a.	
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	.072	4

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicate a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of METHYL METHACRYLATE

The following table provides examples of actual data, from chemical analysis, listed in EPA's Distribution Register of Organic Pollutants in Water (Water DROP) as described by Garrison et. al. (1979). Data are listed for only the categories raw drinking water, finished drinking water, surface water and well water.

Reported Observations of

Methyl Methacrylate

in Major Media Categories

Sample Description	Maximum Concentration Reported, (ug/l)	Reference
Drinking water, finished	10	1
Surface water	1	2

1. Monitoring To Detect Previously Unrecognized Pollutants In Surface Waters, Office of Toxic Substances, U.S. Environmental Protection Agency, Washington, D.C. 20460,EPA-560/6-77-015, July 1977, 375 pp, NTIS

2. Monitoring To Detect Previously Unrecognized Pollutants In Surface Waters, Office of Toxic Substances, U.S. Environmental Protection Agency, Washington, D.C. 20460,EPA-560/6-77-015, July 1977, 375 pp, NTIS

1 "Chemical Hazards Response Information Service (CHRIS); Hazardous Chemical Data," CG-446-2, U.S. Coast Guard, 1974.

2 Dawson, G. W., English, C. J., Petty, S. E., Best estimate by Battelle Northwest.

3 Values of Kow were calculated using a computer routine developed at SRI by Johnson and Leibrand (1980) which uses group values reported by Hansch and Leo (1979).

4 Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by the U.S. EPA.

MONONITROBENZENE

The potential release rates of MONONITROBENZENE from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of MONONITROBENZENE that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of MONONITROBENZENE can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1.

MONONITROBENZENE was found to be a contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from 9.7 mg per square meter of surface area per fraction of the waste stream per year to 39 mg per square meter of surface area per fraction of the waste stream per year for landfills and 140 mg per square meter of surface area per fraction of the waste stream per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to MONONITROBENZENE through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of MONONITROBENZENE that determine its movement and degredation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of

the analysis procedure is contained in ~~Appendix A~~ Attachment I.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of MONONITROBENZENE downstream from points of discharge in rivers is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The potential for degradation or elimination of this compound from a river reach traversed in 5 days is low, with approximately .00 % of the total amount emitted. The projected amount of dissolved MONONITROBENZENE in a river reach traversed in 5 days is high, with approximately 99 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving MONONITROBENZENE is low. Concentration in the sediment may be 15.5 times as great as ambient water concentration. Based on the analysis performed, approximately .065 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving MONONITROBENZENE is low. Based on the analysis performed, approximately .00 % of the amount emitted will be taken up by fish. Concentrations of MONONITROBENZENE in fish may be 13.0 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a river reach traversed in 5 days (50 to 250 miles) is low with approximately .00 %.

Movement of MONONITROBENZENE through ponds and small reservoirs is projected to be widespread. Based on the analysis performed, approximately 99 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The potential for degradation or elimination of this compound in such a pond is low with approximately .0000035 % of the total amount emitted. The projected amount of dissolved MONONITROBENZENE in a pond characterized by a retention time of 100 days is high, with approximately 99 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is low. Based on the analysis performed, approximately .065 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 15.5 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving MONONITROBENZENE is low. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of MONONITROBENZENE in fish may be 13.0 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a pond surface with a retention time of 100 days is low, with approximately .0000066%.

Movement of MONONITROBENZENE through reservoirs and lakes is projected to be widespread. Based on the analysis performed, approximately 99 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The potential for degradation or elimination of this compound in such a reservoir or lake is low , with approximately .00000000% of the total amount emitted. The projected amount of dissolved MONONITROBENZENE in a reservoir or lake characterized by a retention time of 365 days is high, with approximately .00000000% of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is low. Concentration in the sediment may be 15.5 times as great as ambient water concentration. Based on the analysis performed, approximately .065 % of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant MONONITROBENZENE loads is low. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of MONONITROBENZENE in fish may be 13.0 times as great as dissolved concentrations. Estimated potential release from a reservoir or lake with an average retention time of 365 days is low with approximately .00000000%.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- MONONITROBENZENE -----

Parameter	Value	Referen
Solubility (mg/l)	1900	1
Ratio of molecular weights of MONONITROBENZENE to oxygen	3.8	2
Octanol/Water Partition Coefficient	62	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	n.a.	
Microbial degradation rate constant (/days)	.011	4
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	.011	

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicate a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of MONONITROBENZENE

The following table provides examples of actual data, from chemical analysis, listed in EPA's Distribution Register of Organic Pollutants in Water (Water DROP) as described by Garrison et, al, (1979). Data are listed for only the categories raw drinking water, finished drinking water, surface water and well water.

Reported Observations of

Mononitrobenzene

in Major Media Categories

Sample Description	Maximum Concentration Reported, (ug/l)	Reference
Surface water	110	1

1. EPA-R2-73-277 National Environmental Research Center, United States Environmental Protection Agency, Corvallis, OR Current Practice in GC-MS Analysis of Organics in Water US Government Printing Office, Washington, D.C, pp91

1 "Chemical Hazards Response Information System (CHRIS); Hazardous Chemical Data," CG-446-2, U.S. Coast Guard, 1974.

2 Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by the U.S. EPA.

3 Kenaga, E. E., and C. A. I. Goring, "Relationship Between Water Solubility, Soil Sorption, Octanol-Water Partitioning, and Bioconcentration of Chemicals in Biota," ASTM Third Aquatic Toxicology Symposium, New Orleans, Oct. 17 and 18, 1978.

4 Verschueren, K. 1977. Handbook of Environmental Data on Organic Chemicals. Van Nostrand Reinhold Co., New York.

NAPHTHOQUINONE

The potential release rates of NAPHTHOQUINONE from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of NAPHTHOQUINONE that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of NAPHTHOQUINONE can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1.

NAPHTHOQUINONE was found to be a contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from 11 mg per square meter of surface area per fraction of the waste stream per year to 44 mg per square meter of surface area per fraction of the waste stream per year for landfills and 160 mg per square meter of surface area per fraction of the waste stream per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to NAPHTHOQUINONE through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of NAPHTHOQUINONE that determine its movement and degradation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of NAPHTHOQUINONE downstream from points of discharge in rivers is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The potential for degradation or elimination of this compound from a river reach traversed in 5 days is low, with approximately .00 % of the total amount emitted. The projected amount of dissolved NAPHTHOQUINONE in a river reach traversed in 5 days is high, with approximately 99 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving NAPHTHOQUINONE is low. Concentration in the sediment may be 13.8 times as great as ambient water concentration. Based on the analysis performed, approximately .058 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving NAPHTHOQUINONE is low. Based on the analysis performed, approximately .00 % of the amount emitted will be taken up by fish. Concentrations of NAPHTHOQUINONE in fish may be 11.9 times as great as dissolved concentrations. Virtually no releases from

the rivers to the atmosphere should occur.

Movement of NAPHTHOQUINONE through ponds and small reservoirs is projected to be widespread. Based on the analysis performed, approximately 99 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The potential for degradation or elimination of this compound in such a pond is low with approximately .000087 % of the total amount emitted. The projected amount of dissolved NAPHTHOQUINONE in a pond characterized by a retention time of 100 days is high, with approximately 99 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is low. Based on the analysis performed, approximately .058 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 13.8 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving NAPHTHOQUINONE is low. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of NAPHTHOQUINONE in fish may be 11.9 times as great as dissolved concentrations. Virtually no releases from the ponds to the atmosphere should occur.

Movement of NAPHTHOQUINONE through reservoirs and lakes is projected to be widespread. Based on the analysis performed, approximately 99 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The potential for degradation or elimination of this compound in such a reservoir or lake is low , with approximately .00000000% of the total amount emitted. The projected amount of dissolved NAPHTHOQUINONE in a reservoir or lake characterized by a retention time of 365 days is high, with approximately .00000000% of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is low. Concentration in the sediment may be 13.8 times as great as ambient water concentration. Based on the analysis performed, approximately .058 % of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant NAPHTHOQUINONE loads is low. Based on the analysis performed, approximately .00000000% of the amount emitted will be taken up by fish. Concentrations of NAPHTHOQUINONE in fish may be 11.9 times as great as dissolved concentrations. Virtually no releases from the reservoirs or lakes to the atmosphere should occur.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- NAPHTHOQUINONE -----

Parameter	Value	Referen
Solubility (mg/l)	200	1
Ratio of molecular weights of NAPHTHOQUINONE to oxygen	4,9	2
Octanol/Water Partition Coefficient	55	3
Alkaline hydrolysis rate constant (/days)	n,a,	
Acid hydrolysis rate constant (/days)	n,a,	
Hydrolysis rate constant (/days)	n,a,	
Microbial degradation rate constant (/days)	,33	4
Photolysis rate constant (/days)	n,a,	
Oxidation rate constant (/days)	n,a,	
Overall degradation rate constant (/days)	,33	

If data is not available column contains 'n,a,'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes, In some cases degradation information was not specific enough to assign a rate coefficient for each individual process, In other cases, no data indicate a particular process contributes to substantial removal of the substance from aquatic systems, For these situations an n,a, designation was assigned to the specific process rate coefficient,

Table of Chemical Properties Used in Estimating the Persistence of NAPHTHOQUINONE

Dean, J. A., 1973, Lange's Handbook of Chemistry, McGraw-Hill Book Company, New York, N. Y.

Dawson, G. W., English, C. J., Petty, S. E., Best estimate by Battelle Northwest.

Compilation of solvent water partition coefficients as reported in the literature. Developed and maintained by Dr. Corlan Hansch, Pomona College, Pomona, California.

Verschueren, K. 1977. Handbook of Environmental Data on Organic Chemicals. Van Nostrand Reinhold Co., New York.

NITRODIPROPYLAMINE

THE POTENTIAL RELEASE RATES OF NITRODIPROPYLAMINE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF NITRODIPROPYLAMINE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF NITRODIPROPYLAMINE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT I.

NITRODIPROPYLAMINE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 950 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 3800 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 14000 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO NITRODIPROPYLAMINE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF NITRODIPROPYLAMINE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF

THE ANALYSIS PROCEDURE IS CONTAINED IN ATTACHMENT I. ~~APPENDIX A~~.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF NITRODIPROPYLAMINE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 79 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 21 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED NITRODIPROPYLAMINE IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 79 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING NITRODIPROPYLAMINE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00052 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING NITRODIPROPYLAMINE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000019 % OF THE

AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF NITRODIPROPYLAMINE IN FISH MAY BE 0.4 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RIVERS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF NITRODIPROPYLAMINE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 17 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS HIGH WITH APPROXIMATELY83 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED NITRODIPROPYLAMINE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 17 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00060 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING NITRODIPROPYLAMINE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000014 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF NITRODIPROPYLAMINE IN FISH MAY BE 0.4 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE PONDS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF NITRODIPROPYLAMINE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 5.4 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , WITH APPROXIMATELY 95 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED NITRODIPROPYLAMINE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 95 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00063 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT NITRODIPROPYLAMINE LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000090% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF NITRODIPROPYLAMINE IN FISH MAY BE 0.4 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RESERVOIRS OR LAKES TO THE ATMOSPHERE SHOULD OCCUR.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- NITRODIPROPYLAMINE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	1000	1
RATIO OF MOLECULAR WEIGHTS OF NITRODIPROPYLAMINE TO OXYGEN	4.6	2
OCTANOL/WATER PARTITION COEFFICIENT	.63	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	.048	4
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.048	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF NITRODIPROPYLAMINE

1 Dawson, G. W., English, C. J., Petty, S. E., Best estimate by Battelle Northwest.

2 Dawson, G. W., English, C. J., Petty, S. E., Best estimate by Battelle Northwest.

3 Values of Kow were calculated using a computer routine developed at SRI by Johnson and Leibrand (1980) which uses group values reported by Hansch and Leo (1979).

4 Mabey, W. R., Mill, T., Hendry, D. G., Chou, T., Johnson, H. L., Best Judgement. SRI International.

NITROPHENOL

THE POTENTIAL RELEASE RATES OF NITROPHENOL FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF NITROPHENOL THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF NITROPHENOL CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT I.

NITROPHENOL WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 12 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 48 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 180 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO NITROPHENOL THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF NITROPHENOL THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT I.

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POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF NITROPHENOL DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 11 % AND 57 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, RANGING FROM 43 % TO 89 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED NITROPHENOL IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 11 % TO 57 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING NITROPHENOL IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 12.5 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .030 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING NITROPHENOL IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000043 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF NITROPHENOL IN FISH MAY BE 11.1 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A

RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS HIGH RANGING FROM 40 % TO 88 %.

MOVEMENT OF NITROPHENOL THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 23 % AND 31 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS SIGNIFICANT RANGING FROM 68 % TO 77 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED NITROPHENOL IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 23 % TO 31 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .048 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 12.5 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING NITROPHENOL IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000048 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF NITROPHENOL IN FISH MAY BE 11.1 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 50 % TO 64 %.

MOVEMENT OF NITROPHENOL THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 5.5 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , WITH APPROXIMATELY 90 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED NITROPHENOL IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 90 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 12.5 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .050 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT NITROPHENOL LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000025 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF NITROPHENOL IN FISH MAY BE 11.1 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS HIGH, RANGING FROM 70 % TO 83 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- NITROPHENOL -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	14000	1
RATIO OF MOLECULAR WEIGHTS OF NITROPHENOL TO OXYGEN	4.3	2
OCTANOL/WATER PARTITION COEFFICIENT	50	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	.0058	4
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.0058	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF NITROPHENOL

1 Dean, J. A., 1973, Lange's Handbook of Chemistry, McGraw-Hill Book Company, New York, N. Y.

2 Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by the U.S. EPA.

3 Compilation of solvent water partition coefficients as reported in the literature. Developed and maintained by Dr. Corlan Hansch, Pomona College, Pomona, California.

4 Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by the U.S. EPA.

NITROSAMINES

THE POTENTIAL RELEASE RATES OF NITROSAMINES FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF NITROSAMINES THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF NITROSAMINES CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

NITROSAMINES WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 2200 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 8900 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 33000 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO NITROSAMINES THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF NITROSAMINES THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1. BECAUSE NO

DEGRADATION DATA WERE AVAILABLE, THE RESULTS OF THE ANALYSIS SUBSEQUENTLY PRESENTED PROVIDES ESTIMATES OF THE RELATIVE PARTITIONING ONLY BETWEEN AIR, WATER, AND SEDIMENT MEDIA.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF NITROSAMINES DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 7.4 % AND 54 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE PROJECTED AMOUNT OF DISSOLVED NITROSAMINES IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 7.4 % TO 54 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING NITROSAMINES IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.1 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00015 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING NITROSAMINES IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000083% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY

FISH. CONCENTRATIONS OF NITROSAMINES IN FISH MAY BE 0.2 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS HIGH RANGING FROM 46 % TO 93 %.

MOVEMENT OF NITROSAMINES THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 23 % AND 35 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE PROJECTED AMOUNT OF DISSOLVED NITROSAMINES IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 23 % TO 35 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00026 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 0.1 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING NITROSAMINES IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000097% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF NITROSAMINES IN FISH MAY BE 0.2 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 65 % TO 77 %.

MOVEMENT OF NITROSAMINES THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 5.4 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE PROJECTED AMOUNT OF DISSOLVED NITROSAMINES IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 90 % OF THE TOTAL AMOUNT EMITTED.

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THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.1 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00027 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT NITROSAMINES LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000048% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF NITROSAMINES IN FISH MAY BE 0.2 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS HIGH WITH APPROXIMATELY 90 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- 5 NITROSAMINES -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	1000	1
RATIO OF MOLECULAR WEIGHTS OF NITROSAMINES TO OXYGEN	3.2	2
OCTANOL/WATER PARTITION COEFFICIENT	.27	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATES A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF NITROSAMINES

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1 Dean, J. A., 1973, Lange's Handbook of Chemistry, McGraw-Hill Book Company, New York, N. Y.

2 Verschueren, K. 1977. Handbook of Environmental Data on Organic Chemicals. Van Nostrand Reinhold Co., New York.

3 Compilation of solvent water partition coefficients as reported in the literature. Developed and maintained by Dr. Corlan Hansch, Pomona College, Pomona, California.

PARALDEHYDE

THE POTENTIAL RELEASE RATES OF PARALDEHYDE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF PARALDEHYDE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF PARALDEHYDE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~.
ATTACHMENT 1.

PARALDEHYDE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 42 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 170 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 630 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO PARALDEHYDE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF PARALDEHYDE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~.
ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF PARALDEHYDE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE WIDESPREAD. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 89 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 7.1 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED PARALDEHYDE IN A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, WITH APPROXIMATELY 89 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING PARALDEHYDE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 3.5 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .014 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING PARALDEHYDE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000021 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PARALDEHYDE IN FISH MAY BE 4.3 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH

TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS LOW WITH APPROXIMATELY 1.3 %.

MOVEMENT OF PARALDEHYDE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 44 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS SIGNIFICANT WITH APPROXIMATELY55 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED PARALDEHYDE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 44 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .014 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 3.5 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING PARALDEHYDE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000036 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PARALDEHYDE IN FISH MAY BE 4.3 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY 1.9 %.

MOVEMENT OF PARALDEHYDE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 17 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , WITH APPROXIMATELY 82 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED PARALDEHYDE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 82 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 3.5 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .014 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT PARALDEHYDE LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000030 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PARALDEHYDE IN FISH MAY BE 4.3 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS LOW WITH APPROXIMATELY 3.5 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- PARALDEHYDE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	120000	1
RATIO OF MOLECULAR WEIGHTS OF PARALDEHYDE TO OXYGEN	4.1	2
OCTANOL/WATER PARTITION COEFFICIENT	14	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.012	4

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF PARALDEHYDE

1 Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-411.

2 Dawson, G. W., English, C. J., Petty, S. E., Best estimate by Battelle Northwest.

3 Values of Kow were calculated using a computer routine developed at SRI by Johnson and Leibrand (1980) which uses group values reported by Hansch and Leo (1979).

4 Hatfield, R. 1957. Biological Oxidation of Some Organic Compounds. Ind. Eng. Chem. 49:192-196.

PENTACHLOROBENZENE

THE POTENTIAL RELEASE RATES OF PENTACHLOROBENZENE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF PENTACHLOROBENZENE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF PENTACHLOROBENZENE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

PENTACHLOROBENZENE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM .0039 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO .016 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND .057 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO PENTACHLOROBENZENE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF PENTACHLOROBENZENE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF

THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT 1. BECAUSE NO DEGRADATION DATA WERE AVAILABLE, THE RESULTS OF THE ANALYSIS SUBSEQUENTLY PRESENTED PROVIDES ESTIMATES OF THE RELATIVE PARTITIONING ONLY BETWEEN AIR, WATER, AND SEDIMENT MEDIA.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF PENTACHLOROBENZENE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE WIDESPREAD. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 100 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE PROJECTED AMOUNT OF DISSOLVED PENTACHLOROBENZENE IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 4.9 % TO 38 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING PENTACHLOROBENZENE IS HIGH. CONCENTRATION IN THE SEDIMENT MAY BE 38500.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, BETWEEN 62 % AND 95 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING PENTACHLOROBENZENE IS HIGH. BASED ON THE

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ANALYSIS PERFORMED, APPROXIMATELY .0085 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PENTACHLOROBENZENE IN FISH MAY BE 4586.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RIVERS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF PENTACHLOROBENZENE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 7.8 % AND 45 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE PROJECTED AMOUNT OF DISSOLVED PENTACHLOROBENZENE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 4.9 % TO 38 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS HIGH. BASED ON THE ANALYSIS PERFORMED, BETWEEN 62 % AND 95 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 38500.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING PENTACHLOROBENZENE IS HIGH. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .033 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PENTACHLOROBENZENE IN FISH MAY BE 4586.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE PONDS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF PENTACHLOROBENZENE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 5.9 % AND 41 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE PROJECTED AMOUNT OF DISSOLVED PENTACHLOROBENZENE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS SIGNIFICANT, RANGING FROM .00022 % TO .0034 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS HIGH. CONCENTRATION IN THE SEDIMENT MAY BE 38500.0

TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, BETWEEN 62 % AND 95 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT PENTACHLOROBENZENE LOADS IS HIGH. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .070 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PENTACHLOROBENZENE IN FISH MAY BE 4586.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RESERVOIRS OR LAKES TO THE ATMOSPHERE SHOULD OCCUR.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- PENTACHLOROBENZENE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	.14	1
RATIO OF MOLECULAR WEIGHTS OF PENTACHLOROBENZENE TO OXYGEN	7.8	2
OCTANOL/WATER PARTITION COEFFICIENT	150000	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATES A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF PENTACHLOROBENZENE

1 Dean, J. A., 1973, Lange's Handbook of Chemistry, McGraw-Hill Book Company, New York, N. Y.

2 Kenaga, E. E., and C. A. I. Goring, "Relationship Between Water Solubility, Soil Sorption, Octanol-Water Partitioning, and Bioconcentration of Chemicals in Biota," ASTM Third Aquatic Toxicology Symposium, New Orleans, Oct. 17 and 18, 1978.

3 Kenaga, E. E., and C. A. I. Goring, "Relationship Between Water Solubility, Soil Sorption, Octanol-Water Partitioning, and Bioconcentration of Chemicals in Biota," ASTM Third Aquatic Toxicology Symposium, New Orleans, Oct. 17 and 18, 1978.

PENTACHLOROETHANE

THE POTENTIAL RELEASE RATES OF PENTACHLOROETHANE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF PENTACHLOROETHANE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF PENTACHLOROETHANE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

PENTACHLOROETHANE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 160 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 660 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 2400 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO PENTACHLOROETHANE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF PENTACHLOROETHANE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF

THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT 1. BECAUSE NO DEGRADATION DATA WERE AVAILABLE, THE RESULTS OF THE ANALYSIS SUBSEQUENTLY PRESENTED PROVIDES ESTIMATES OF THE RELATIVE PARTITIONING ONLY BETWEEN AIR, WATER, AND SEDIMENT MEDIA.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF PENTACHLOROETHANE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, BETWEEN .00089 % AND 6.4 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE PROJECTED AMOUNT OF DISSOLVED PENTACHLOROETHANE IN A RIVER REACH TRAVERSED IN 5 DAYS IS LOW, RANGING FROM .00089 % TO 6.4 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING PENTACHLOROETHANE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.9 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000040% OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING PENTACHLOROETHANE IS LOW. BASED ON THE

ANALYSIS PERFORMED, APPROXIMATELY .0000026 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PENTACHLOROETHANE IN FISH MAY BE 1.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS HIGH RANGING FROM 94 % TO 100 %.

MOVEMENT OF PENTACHLOROETHANE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 6.3 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE PROJECTED AMOUNT OF DISSOLVED PENTACHLOROETHANE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 6.3 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0034 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 0.9 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING PENTACHLOROETHANE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000019 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PENTACHLOROETHANE IN FISH MAY BE 1.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS HIGH, WITH APPROXIMATELY 89 %.

MOVEMENT OF PENTACHLOROETHANE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 1.3 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE PROJECTED AMOUNT OF DISSOLVED PENTACHLOROETHANE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 97 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.9 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0036 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT PENTACHLOROETHANE LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000078% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PENTACHLOROETHANE IN FISH MAY BE 1.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS HIGH WITH APPROXIMATELY 97 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- PENTACHLOROETHANE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	500	1
RATIO OF MOLECULAR WEIGHTS OF PENTACHLOROETHANE TO OXYGEN	6.3	2
OCTANOL/WATER PARTITION COEFFICIENT	3.6	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATES A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF PENTACHLOROETHANE

THE FOLLOWING TABLE PROVIDES EXAMPLES OF ACTUAL DATA, FROM CHEMICAL ANALYSIS, LISTED IN EPA'S DISTRIBUTION REGISTER OF ORGANIC POLLUTANTS IN WATER (WATER DROP) AS DESCRIBED BY GARRISON ET. AL. (1979). DATA ARE LISTED FOR ONLY THE CATEGORIES RAW DRINKING WATER, FINISHED DRINKING WATER, SURFACE WATER AND WELL WATER.

REPORTED OBSERVATIONS OF

PENTACHLOROETHANE

IN MAJOR MEDIA CATEGORIES

SAMPLE DESCRIPTION	MAXIMUM CONCENTRATION REPORTED, (UG/L)	REFERENCE
DRINKING WATER, FINISHED	<0.1	1
SURFACE WATER	1	2

1. ANALYTICAL REPORT: NEW ORLEANS AREA WATER SUPPLY STUDY; EPA 906/9-75-003 UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, REGION VI, DALLAS, TX, DEC. 9, 1975, 95 PAGES,NTIS

2. MONITORING TO DETECT PREVIOUSLY UNRECOGNIZED POLLUTANTS IN SURFACE WATERS, OFFICE OF TOXIC SUBSTANCES, U.S. ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. 20460,EPA-560/6-77-015, JULY 1977, 375 PP, NTIS

1 Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-293.

2 Neely, W. B., "Persistence Protocol Project," Workshop on Persistence for the National Research Council, Ottawa, Canada, April 1978.

3 Values of Kow were calculated using a computer routine developed at SRI by Johnson and Leibrand (1980) which uses group values reported by Hansch and Leo (1979).

PENTACHLOROPHENOL

THE POTENTIAL RELEASE RATES OF PENTACHLOROPHENOL FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF PENTACHLOROPHENOL THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF PENTACHLOROPHENOL CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT I.

PENTACHLOROPHENOL WAS FOUND TO BE THE MAJOR CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 2100 MG PER SQUARE METER OF SURFACE AREA PER YEAR TO 8400 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LANDFILLS AND .00 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS. PENTACHLOROPHENOL WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM .0059 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO .024 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND .087 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO PENTACHLOROPHENOL THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL

PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF PENTACHLOROPHENOL THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF PENTACHLOROPHENOL DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE WIDESPREAD. BASED ON THE ANALYSIS PERFORMED, BETWEEN 68 % AND 94 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 5.7 % TO 32 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED PENTACHLOROPHENOL IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 6.9 % TO 33 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING PENTACHLOROPHENOL IS HIGH. CONCENTRATION IN THE SEDIMENT MAY BE 25500.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, BETWEEN 35 % AND 87 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING PENTACHLOROPHENOL IS HIGH. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0067 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PENTACHLOROPHENOL IN FISH MAY BE 3367.5 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RIVERS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF PENTACHLOROPHENOL THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .80 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS SIGNIFICANT RANGING FROM 9.3 % TO 50 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED PENTACHLOROPHENOL IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY .58 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS HIGH. BASED ON THE ANALYSIS PERFORMED, BETWEEN 46 % AND 90 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 25500.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING PENTACHLOROPHENOL IS HIGH. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0020 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PENTACHLOROPHENOL IN FISH MAY BE 3367.5 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE PONDS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF PENTACHLOROPHENOL THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .16 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE

TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS SIGNIFICANT , RANGING FROM 8.0 % TO 50 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED PENTACHLOROPHENOL IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 8.0 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS HIGH. CONCENTRATION IN THE SEDIMENT MAY BE 25500.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, BETWEEN 49 % AND 92 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT PENTACHLOROPHENOL LOADS IS HIGH. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0012 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PENTACHLOROPHENOL IN FISH MAY BE 3367.5 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RESERVOIRS OR LAKES TO THE ATMOSPHERE SHOULD OCCUR.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- PENTACHLOROPHENOL -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	14	1
RATIO OF MOLECULAR WEIGHTS OF PENTACHLOROPHENOL TO OXYGEN	8.3	2
OCTANOL/WATER PARTITION COEFFICIENT	100000	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.16	4

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF PENTACHLOROPHENOL

THE FOLLOWING TABLE PROVIDES EXAMPLES OF ACTUAL DATA, FROM CHEMICAL ANALYSIS, LISTED IN EPA'S DISTRIBUTION REGISTER OF ORGANIC POLLUTANTS IN WATER (WATER DROP) AS DESCRIBED BY GARRISON ET. AL. (1979). DATA ARE LISTED FOR ONLY THE CATEGORIES RAW DRINKING WATER, FINISHED DRINKING WATER, SURFACE WATER AND WELL WATER.

REPORTED OBSERVATIONS OF

PENTACHLOROPHENOL

IN MAJOR MEDIA CATEGORIES

SAMPLE DESCRIPTION	MAXIMUM CONCENTRATION REPORTED, (UG/L)	REFERENCE
DRINKING WATER, FINISHED	0.06	1
SURFACE WATER	3.3	2

1. ENVIRONMENTAL SCIENCE TECHNOLOGY, 7, 929 (1973)

2. ENVIRONMENTAL SCIENCE TECHNOLOGY, 7, 929 (1973)

1 Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-432.

2 Kenaga, E. E., and C. A. I. Goring, "Relationship Between Water Solubility, Soil Sorption, Octanol-Water Partitioning, and Bioconcentration of Chemicals in Biota," ASTM Third Aquatic Toxicology Symposium, New Orleans, Oct. 17 and 18, 1978.

3 Kenaga, E. E., and C. A. I. Goring, "Relationship Between Water Solubility, Soil Sorption, Octanol-Water Partitioning, and Bioconcentration of Chemicals in Biota," ASTM Third Aquatic Toxicology Symposium, New Orleans, Oct. 17 and 18, 1978.

4 Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by the U.S. EPA.

PENTADIENE

THE POTENTIAL RELEASE RATES OF PENTADIENE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF PENTADIENE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF PENTADIENE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

PENTADIENE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 20 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 79 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 290 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO PENTADIENE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF PENTADIENE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1. BECAUSE NO

DEGRADATION DATA WERE AVAILABLE, THE RESULTS OF THE ANALYSIS SUBSEQUENTLY PRESENTED PROVIDES ESTIMATES OF THE RELATIVE PARTITIONING ONLY BETWEEN AIR, WATER, AND SEDIMENT MEDIA.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF PENTADIENE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 4.2 % AND 47 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE PROJECTED AMOUNT OF DISSOLVED PENTADIENE IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 4.2 % TO 47 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING PENTADIENE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 7.6 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .015 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING PENTADIENE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000027 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY

FISH. CONCENTRATIONS OF PENTADIENE IN FISH MAY BE 7.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS HIGH RANGING FROM 53 % TO 96 %.

MOVEMENT OF PENTADIENE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 20 % AND 30 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE PROJECTED AMOUNT OF DISSOLVED PENTADIENE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 20 % TO 30 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .029 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 7.6 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING PENTADIENE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000029 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PENTADIENE IN FISH MAY BE 7.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS HIGH, RANGING FROM 69 % TO 80 %.

MOVEMENT OF PENTADIENE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 4.4 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE PROJECTED AMOUNT OF DISSOLVED PENTADIENE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 91 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 7.6 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .030 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT PENTADIENE LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000014 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PENTADIENE IN FISH MAY BE 7.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS HIGH WITH APPROXIMATELY 91 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- PENTADIENE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	10	1
RATIO OF MOLECULAR WEIGHTS OF PENTADIENE TO OXYGEN	2.1	2
OCTANOL/WATER PARTITION COEFFICIENT	30	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATES A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF PENTADIENE

1 Dean, J. A., 1973, Lange's Handbook of Chemistry, McGraw-Hill Book Company, New York, N. Y.

2 Dawson, G. W., English, C. J., Petty, S. E., Best estimate by Battelle Northwest.

3 Values of Kow based on Koc/solubility correlation developed by SRI International, J. H. Smith and D. C. Bomberger.

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PHENOL

THE POTENTIAL RELEASE RATES OF PHENOL FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF PHENOL THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF PHENOL CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A.~~ ATTACHMENT 1.

PHENOL WAS FOUND TO BE THE MAJOR CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 10000000 MG PER SQUARE METER OF SURFACE AREA PER YEAR TO 40000000 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LANDFILLS AND .00 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS. PHENOL WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 19 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 76 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 280 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO PHENOL THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF

RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF PHENOL THAT DETERMINE ITS MOVEMENT AND DEGRADATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT I.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF PHENOL DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 4.1 % AND 32 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, RANGING FROM 68 % TO 96 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED PHENOL IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 4.1 % TO 32 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING PHENOL IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 7.9 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .011 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING PHENOL IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000023 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PHENOL IN FISH MAY BE 7.9 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS HIGH RANGING FROM 38 % TO 81 %.

MOVEMENT OF PHENOL THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 6.9 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS HIGH WITH APPROXIMATELY92 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED PHENOL IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY 6.9 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .030 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 7.9 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING PHENOL IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000010 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PHENOL IN FISH MAY BE 7.9 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 15 % TO 24 %.

MOVEMENT OF PHENOL THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 1.8 % OF THE AMOUNT

EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , WITH APPROXIMATELY 97 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED PHENOL IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 97 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 7.9 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .032 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT PHENOL LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000057 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PHENOL IN FISH MAY BE 7.9 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS SIGNIFICANT, RANGING FROM 20 % TO 33 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- PHENOL -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	67000	1
RATIO OF MOLECULAR WEIGHTS OF PHENOL TO OXYGEN	2.9	2
OCTANOL/WATER PARTITION COEFFICIENT	32	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	.10	4
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.10	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF PHENOL

1 Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-427.

2 Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by the U.S. EPA.

3 Daniels, S. L., W. B. Neely, and R. E. Bailey, "Toxic 'Priority' Pollutant Perspectives," Environmental Sciences Research, Dow Chemical Company, May 9, 1979.

4 Goring C. A. I. and Hamaker, J. H., "Organic Chemicals in the Soil Environment," Marcek Dekker, New York, 1972.

PHORATE

THE POTENTIAL RELEASE RATES OF PHORATE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF PHORATE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF PHORATE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

PHORATE WAS FOUND TO BE THE MAJOR CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 7500 MG PER SQUARE METER OF SURFACE AREA PER YEAR TO 30000 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LANDFILLS AND .00 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS. PHORATE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 33 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 130 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 490 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO PHORATE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF

RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF PHORATE THAT DETERMINE ITS MOVEMENT AND DEGRADATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF PHORATE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE WIDESPREAD. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 91 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS LOW, WITH APPROXIMATELY 9.0 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED PHORATE IN A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, WITH APPROXIMATELY 91 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING PHORATE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 4.5 TIMES

AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .017 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING PHORATE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000025 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PHORATE IN FISH MAY BE 5.2 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RIVERS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF PHORATE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 34 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS SIGNIFICANT WITH APPROXIMATELY65 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED PHORATE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 34 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .018 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 4.5 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING PHORATE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000034 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PHORATE IN FISH MAY BE 5.2 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE PONDS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF PHORATE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 13 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS

COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , WITH APPROXIMATELY 87 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED PHORATE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 87 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 4.5 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .018 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT PHORATE LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000026 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PHORATE IN FISH MAY BE 5.2 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RESERVOIRS OR LAKES TO THE ATMOSPHERE SHOULD OCCUR.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- PHORATE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	50	1
RATIO OF MOLECULAR WEIGHTS OF PHORATE TO OXYGEN	8.1	2
OCTANOL/WATER PARTITION COEFFICIENT	18	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	.019	4
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.019	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF PHORATE

1 Chemical Week Pesticides Register.

2 Chemical Week Pesticides Register.

3 Values of Kow based on Koc/solubility correlation developed by SRI International, J. H. Smith and D. C. Bomberger.

4 Mabey, W. R., Mill, T., Hendry, D. G., Chou, T., Johnson, H. L., Best Judgement. SRI International.

0,0-DIETHYL-PHOSPHORODITHIOATE

The potential release rates of 0,0-DIETHYL-PHOSPHORODITHIOATE from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of 0,0-DIETHYL-PHOSPHORODITHIOATE that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of 0,0-DIETHYL-PHOSPHORODITHIOATE can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~.
Attachment 1.

0,0-DIETHYL-PHOSPHORODITHIOATE was found to be the major contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be approximately .00 mg per square meter of surface area per year' for landfills and .00 mg per square meter of surface area per year for lagoons. Approximately .00 % of the material emitted from a landfill is estimated to reach surface waters. Approximately .00000000% of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to 0,0-DIETHYL-PHOSPHORODITHIOATE through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of 0,0-DIETHYL-PHOSPHORODITHIOATE that determine its movement and degradation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of O,O-DIETHYL-PHOSPHORODITHIOATE downstream from points of discharge in rivers is projected to be widespread. Based on the analysis performed, approximately 99 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The potential for degradation or elimination of this compound from a river reach traversed in 5 days is low, with approximately .95 % of the total amount emitted. The projected amount of dissolved O,O-DIETHYL-PHOSPHORODITHIOATE in a river reach traversed in 5 days is high, with approximately 99 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving O,O-DIETHYL-PHOSPHORODITHIOATE is low. Concentration in the sediment may be 0.7 times as great as ambient water concentration. Based on the analysis performed, approximately .0029 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving 0,0-DIETHYL-PHOSPHORODITHIOATE is low. Based on the analysis performed, approximately .0000064 % of the amount emitted will be taken up by fish. Concentrations of 0,0-DIETHYL-PHOSPHORODITHIOATE in fish may be 1.3 times as great as dissolved concentrations. Virtually no releases from the rivers to the atmosphere should occur.

Movement of 0,0-DIETHYL-PHOSPHORODITHIOATE through ponds and small reservoirs is projected to be widespread. Based on the analysis performed, approximately 84 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The potential for degradation or elimination of this compound in such a pond is significant with approximately 16 % of the total amount emitted. The projected amount of dissolved 0,0-DIETHYL-PHOSPHORODITHIOATE in a pond characterized by a retention time of 100 days is high, with approximately 84 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is low. Based on the analysis performed, approximately .0029 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 0.7 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving 0,0-DIETHYL-PHOSPHORODITHIOATE is low. Based on the analysis performed, approximately .000020 % of the amount emitted will be taken up by fish. Concentrations of 0,0-DIETHYL-PHOSPHORODITHIOATE in fish may be 1.3 times as great as dissolved concentrations. Virtually no releases from the ponds to the atmosphere should occur.

Movement of 0,0-DIETHYL-PHOSPHORODITHIOATE through reservoirs and lakes is projected to be significant. Based on the analysis performed, approximately 59 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The potential for degradation or elimination of this compound in such a reservoir or lake is significant , with approximately 41 % of the total amount emitted. The projected amount of dissolved 0,0-DIETHYL-PHOSPHORODITHIOATE in a reservoir or lake characterized by a retention time of 365 days is significant, with approximately 41 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is low. Concentration in the sediment may be 0.7 times as great as ambient water concentration. Based on the analysis performed, approximately .0029 % of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant O,O-DIETHYL-PHOSPHORODITHIOATE loads is low. Based on the analysis performed, approximately .000030 % of the amount emitted will be taken up by fish. Concentrations of O,O-DIETHYL-PHOSPHORODITHIOATE in fish may be 1.3 times as great as dissolved concentrations. Virtually no releases from the reservoirs or lakes to the atmosphere should occur.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- 0,0-DIETHYL-PHOSPHORODITHIOATE -----

Parameter	Value	Referen
Solubility (mg/l)	100	1
Ratio of molecular weights of 0,0-DIETHYL-PHOSPHORODITHIOATE to oxygen	5.8	2
Octanol/Water Partition Coefficient	2.8	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	.0019	4
Microbial degradation rate constant (/days)	n.a.	
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	.0019	

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicate a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of 0,0-DIETHYL-PHOSPHORODITHIOATE

1 Dawson, G. W., English, C. J., Petty, S. E., Best estimate by Battelle Northwest.

2 Dawson, G. W., English, C. J., Petty, S. E., Best estimate by Battelle Northwest.

3 Dawson, G. W., English, C. J., Petty, S. E., Best estimate by Battelle Northwest.

4 Mabey, W. R., Mill, T., Hendry, D. G., Chou, T., Johnson, H. L., Best Judgement. SRI International.

TRIETHYLPHOSPHOROTHIOATE

The potential release rates of TRIETHYLPHOSPHOROTHIOATE from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of TRIETHYLPHOSPHOROTHIOATE that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of TRIETHYLPHOSPHOROTHIOATE can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1.

TRIETHYLPHOSPHOROTHIOATE was found to be a contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be approximately .00 mg per square meter of surface area per fraction of the waste stream per year for landfills and .00000000 mg per square meter of surface area per fraction of the waste stream per year for lagoons. Approximately .00 % of the material emitted from a landfill is estimated to reach surface waters. Approximately .00000000% of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to TRIETHYLPHOSPHOROTHIOATE through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of TRIETHYLPHOSPHOROTHIOATE that determine its movement and degredation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed

description of the analysis procedure is contained in ~~Appendix A~~.
Attachment 1.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of TRIETHYLPHOSPHOROTHIOATE downstream from points of discharge in rivers is projected to be widespread. Based on the analysis performed, approximately 99 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The potential for degradation or elimination of this compound from a river reach traversed in 5 days is low, with approximately .95 % of the total amount emitted. The projected amount of dissolved TRIETHYLPHOSPHOROTHIOATE in a river reach traversed in 5 days is high, with approximately 99 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving TRIETHYLPHOSPHOROTHIOATE is low. Concentration in the sediment may be 0.2 times as great as ambient water concentration. Based on the analysis performed, approximately .0010 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving TRIETHYLPHOSPHOROTHIOATE is low. Based on the analysis performed, approximately .0000029 % of the amount emitted will be taken up by fish. Concentrations of TRIETHYLPHOSPHOROTHIOATE in fish may be 0.6 times as great as dissolved concentrations. Virtually no releases from the rivers to the atmosphere should occur.

Movement of TRIETHYLPHOSPHOROTHIOATE through ponds and small reservoirs is projected to be widespread. Based on the analysis performed, approximately 84 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The potential for degradation or elimination of this compound in such a pond is significant with approximately 16 % of the total amount emitted. The projected amount of dissolved TRIETHYLPHOSPHOROTHIOATE in a pond characterized by a retention time of 100 days is high, with approximately 84 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is low. Based on the analysis performed, approximately .0010 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 0.2 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving TRIETHYLPHOSPHOROTHIOATE is low. Based on the analysis performed, approximately .0000094 % of the amount emitted will be taken up by fish. Concentrations of TRIETHYLPHOSPHOROTHIOATE in fish may be 0.6 times as great as dissolved concentrations. Virtually no releases from the ponds to the atmosphere should occur.

Movement of TRIETHYLPHOSPHOROTHIOATE through reservoirs and lakes is projected to be significant. Based on the analysis performed, approximately 59 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The potential for degradation or elimination of this compound in such a reservoir or lake is significant , with approximately 41 % of the total amount emitted. The projected amount of dissolved TRIETHYLPHOSPHOROTHIOATE in a reservoir or lake characterized by a retention time of 365 days is significant, with approximately 41 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is low. Concentration in the sediment may be 0.2 times as great as ambient water concentration. Based on the analysis performed, approximately .0010 % of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant TRIETHYLPHOSPHOROTHIOATE loads is low. Based on the analysis performed, approximately .000014 % of the amount emitted will be taken up by fish. Concentrations of TRIETHYLPHOSPHOROTHIOATE in fish may be 0.6 times as great as dissolved concentrations. Virtually no releases from the reservoirs or lakes to the atmosphere should occur.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- TRIETHYLPHOSPHOROTHIOATE -----

Parameter	Value	Referen
Solubility (mg/l)	1000	1
Ratio of molecular weights of TRIETHYLPHOSPHOROTHIOATE to oxygen	6.2	2
Octanol/Water Partition Coefficient	1.0	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	.0019	4
Microbial degradation rate constant (/days)	n.a.	
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	.0019	

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicate a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of TRIETHYLPHOSPHOROTHIOATE

1 Dawson, G. W., English, C. J., Petty, S. E., Best estimate by Battelle Northwest.

2 Dawson, G. W., English, C. J., Petty, S. E., Best estimate by Battelle Northwest.

3 Best Judgement by J. W. Falco, EPA-ERL, Athens, Georgia.

4 Mabey, W. R., Mill, T., Hendry, D. G., Chou, T., Johnson, H. L., Best Judgement, SRI International.

PHTHALIC ANHYDRIDE

THE POTENTIAL RELEASE RATES OF PHTHALIC ANHYDRIDE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF PHTHALIC ANHYDRIDE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF PHTHALIC ANHYDRIDE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

PHTHALIC ANHYDRIDE WAS FOUND TO BE THE MAJOR CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 9300000 MG PER SQUARE METER OF SURFACE AREA PER YEAR TO 37000000 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LANDFILLS AND .00 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS. PHTHALIC ANHYDRIDE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 2500 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 10000 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 37000 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO PHTHALIC ANHYDRIDE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL

PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF PHTHALIC ANHYDRIDE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT I.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF PHTHALIC ANHYDRIDE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE WIDESPREAD. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 84 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 13 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED PHTHALIC ANHYDRIDE IN A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, WITH APPROXIMATELY 84 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING PHTHALIC ANHYDRIDE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.1 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00022 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING PHTHALIC ANHYDRIDE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000095% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PHTHALIC ANHYDRIDE IN FISH MAY BE 0.2 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS LOW WITH APPROXIMATELY 1.3 %.

MOVEMENT OF PHTHALIC ANHYDRIDE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 29 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS SIGNIFICANT WITH APPROXIMATELY71 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED PHTHALIC ANHYDRIDE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 29 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00023 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 0.1 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING PHTHALIC ANHYDRIDE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000011 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PHTHALIC ANHYDRIDE IN FISH MAY BE 0.2 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY 1.2 %.

MOVEMENT OF PHTHALIC ANHYDRIDE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 9.9 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , WITH APPROXIMATELY 90 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED PHTHALIC ANHYDRIDE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 90 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.1 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00024 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT PHTHALIC ANHYDRIDE LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000080% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PHTHALIC ANHYDRIDE IN FISH MAY BE 0.2 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS LOW WITH APPROXIMATELY 2.0 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- PHTHALIC ANHYDRIDE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	62000	1
RATIO OF MOLECULAR WEIGHTS OF PHTHALIC ANHYDRIDE TO OXYGEN	4.6	2
OCTANOL/WATER PARTITION COEFFICIENT	.24	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.024	4

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF PHTHALIC ANHYDRIDE

Weast, R. C., Editor, CRC Handbook of Chemistry and Physics, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-436.

Kenaga, E. E., and C. A. I. Goring, "Relationship Between Water Solubility, Soil Sorption, Octanol-Water Partitioning, and Bioconcentration of Chemicals in Biota," ASTM Third Aquatic Toxicology Symposium, New Orleans, Oct. 17 and 18, 1978.

Kenaga, E. E., and C. A. I. Goring, "Relationship Between Water Solubility, Soil Sorption, Octanol-Water Partitioning, and Bioconcentration of Chemicals in Biota," ASTM Third Aquatic Toxicology Symposium, New Orleans, Oct. 17 and 18, 1978.

Thom, N. S., and A. R. Agg, 1975, The Breakdown of Synthetic Compounds in Biological Process, Proc. R. Soc. London. B. 189, 347-357.

PROPIONIC ACID

THE POTENTIAL RELEASE RATES OF PROPIONIC ACID FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF PROPIONIC ACID THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF PROPIONIC ACID CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~.
ATTACHMENT I.

PROPIONIC ACID WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 600 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 2400 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 8800 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO PROPIONIC ACID THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF PROPIONIC ACID THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~.
ATTACHMENT I.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF PROPIONIC ACID DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 2.7 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, WITH APPROXIMATELY 97 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED PROPIONIC ACID IN A RIVER REACH TRAVERSED IN 5 DAYS IS LOW, WITH APPROXIMATELY 2.7 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING PROPIONIC ACID IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000029 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING PROPIONIC ACID IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000080% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PROPIONIC ACID IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM

THE RIVERS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF PROPIONIC ACID THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 1.4 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS HIGH WITH APPROXIMATELY99 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED PROPIONIC ACID IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY 1.4 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00094 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING PROPIONIC ACID IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000015% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PROPIONIC ACID IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE PONDS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF PROPIONIC ACID THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .38 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , WITH APPROXIMATELY 100 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED PROPIONIC ACID IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 100 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 0.2 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0010 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT PROPIONIC ACID LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000009% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PROPIONIC ACID IN FISH MAY BE 0.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RESERVOIRS OR LAKES TO THE ATMOSPHERE SHOULD OCCUR.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

PROPIONIC ACID

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	1000000	1
RATIO OF MOLECULAR WEIGHTS OF PROPIONIC ACID TO OXYGEN	2.3	2
OCTANOL/WATER PARTITION COEFFICIENT	1.0	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	.72	4
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.72	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF PROPIONIC ACID

"Chemical Hazards Response Information System (CHRIS); Hazardous Chemical Data," CG-446-2, U.S. Coast Guard, 1974.

Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by the U.S. EPA.

Best Judgement by J. W. Falco, EPA-ERL, Athens, Georgia.

Hatfield, R., 1957, Biological Oxidation of Some Organic Compounds, Ind. Eng. Chem. 49:192-196.

PYRIDINE

THE POTENTIAL RELEASE RATES OF PYRIDINE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF PYRIDINE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF PYRIDINE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~.
ATTACHMENT I.

PYRIDINE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 130 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 530 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 1900 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO PYRIDINE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF PYRIDINE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~.
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POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF PYRIDINE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 2.7 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, WITH APPROXIMATELY 97 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED PYRIDINE IN A RIVER REACH TRAVERSED IN 5 DAYS IS LOW, WITH APPROXIMATELY 2.7 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING PYRIDINE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 1.1 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00013 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING PYRIDINE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0000025 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PYRIDINE IN FISH MAY BE 1.8 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RIVERS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF PYRIDINE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 1.4 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS HIGH WITH APPROXIMATELY99 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED PYRIDINE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY 1.4 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0043 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 1.1 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING PYRIDINE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000048% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PYRIDINE IN FISH MAY BE 1.8 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE PONDS TO THE ATMOSPHERE SHOULD OCCUR.

MOVEMENT OF PYRIDINE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .38 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , WITH APPROXIMATELY 100 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED PYRIDINE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 100 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 1.1 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0046 % OF THE AMOUNT

EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT PYRIDINE LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00000028% OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF PYRIDINE IN FISH MAY BE 1.8 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. VIRTUALLY NO RELEASES FROM THE RESERVOIRS OR LAKES TO THE ATMOSPHERE SHOULD OCCUR.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- PYRIDINE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	1000000	1
RATIO OF MOLECULAR WEIGHTS OF PYRIDINE TO OXYGEN	2.5	2
OCTANOL/WATER PARTITION COEFFICIENT	4.6	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	.72	4
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.72	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF PYRIDINE

1 Fazzalari, F. A., Ed., 1978, Compilation of Odor and Taste Threshold Values Data, American Society for Testing and Materials, Philadelphia, PA.

2 Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by the U.S. EPA.

3 Values of Kow were calculated using a computer routine developed at SRI by Johnson and Leibrand (1980) which uses group values reported by Hansch and Leo (1979).

4 Verschueren, K. 1977. Handbook of Environmental Data on Organic Chemicals. Van Nostrand Reinhold Co., New York.

TCDD

The potential release rates of TCDD from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of TCDD that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of TCDD can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~appendix A~~. Attachment 1.

TCDD was found to be a contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from .0015 mg per square meter of surface area per fraction of the waste stream per year to .0060 mg per square meter of surface area per fraction of the waste stream per year for landfills and .022 mg per square meter of surface area per fraction of the waste stream per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to TCDD through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of TCDD that determine its movement and degredation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of the analysis procedure is contained in ~~appendix A~~. Attachment 1.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of TCDD downstream from points of discharge in rivers is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The potential for degradation or elimination of this compound from a river reach traversed in 5 days is low, with approximately .019 % of the total amount emitted. The projected amount of dissolved TCDD in a river reach traversed in 5 days is significant, ranging from 2.0 % to 19 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving TCDD is high. Concentration in the sediment may be 100000.0 times as great as ambient water concentration. Based on the analysis performed, between 81 % and 98 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving TCDD is high. Based on the analysis performed, approximately .0090 % of the amount emitted will be taken up by fish. Concentrations of TCDD in fish may be 9384.2 times as great as dissolved concentrations. Virtually no releases from the rivers to the atmosphere should occur.

Movement of TCDD through ponds and small reservoirs is projected to be significant. Based on the analysis performed, between 4.6 % and 25 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The potential for degradation or elimination of this compound in such a pond is low with approximately .35 % of the total amount emitted. The projected amount of dissolved TCDD in a pond characterized by a retention time of 100 days is significant, ranging from 1.8 % to 17 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is high. Based on the analysis performed, between 80 % and 98 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 100000.0 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving TCDD is high. Based on the analysis performed, approximately .030 % of the amount emitted will be taken up by fish. Concentrations of TCDD in fish may be 9384.2 times as great as dissolved concentrations. Virtually no releases from the ponds to the atmosphere should occur.

Movement of TCDD through reservoirs and lakes is projected to be significant. Based on the analysis performed, between 2.0 % and 15 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The potential for degradation or elimination of this compound in such a reservoir or lake is low , ranging from .93 % to 8.5 % of the total amount emitted. The projected amount of dissolved TCDD in a reservoir or lake characterized by a retention time of 365 days is significant, ranging from .93 % to 8.5 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is high. Concentration in the sediment may be 100000.0 times as great as ambient water concentration. Based on the analysis performed, between 79 % and 98 % of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant TCDD loads is high. Based on the analysis performed, approximately .046 % of the amount emitted will be taken up by fish. Concentrations of TCDD in fish may be 9384.2 times as great as dissolved concentrations. Virtually no releases from the reservoirs or lakes to the atmosphere should occur.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- TCDD -----

Parameter	Value	Referen
Solubility (mg/l)	.00020	1
Ratio of molecular weights of TCDD to oxygen	10	2
Octanol/water Partition Coefficient	400000	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	n.a.	
Microbial degradation rate constant (/days)	n.a.	
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	.0019	4

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicate a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of TCDD

1 Dawson, G. W., English, C. J., Petty, S. E., Best estimate by Battelle Northwest.

2 Criteria Document prepared for Priority Pollutants per Section 307 of the Federal Water Pollution Control Act and the Clean Water Act as amended under contract for the U.S. Environmental Protection Agency.

3 Values of Kow based on Koc/solubility correlation developed by SRI International, J. H. Smith and D. C. Bomberger.

4 Mabey, W. R., Mill, T., Hendry, D. G., Chou, T., Johnson, H. L., Best Judgement. SRI International.

TETRACHLOROBENZENE

THE POTENTIAL RELEASE RATES OF TETRACHLOROBENZENE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF TETRACHLOROBENZENE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF TETRACHLOROBENZENE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT 1.

TETRACHLOROBENZENE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM .13 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO .51 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 1.9 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO TETRACHLOROBENZENE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF TETRACHLOROBENZENE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF

THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT I. BECAUSE NO DEGRADATION DATA WERE AVAILABLE, THE RESULTS OF THE ANALYSIS SUBSEQUENTLY PRESENTED PROVIDES ESTIMATES OF THE RELATIVE PARTITIONING ONLY BETWEEN AIR, WATER, AND SEDIMENT MEDIA.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF TETRACHLOROBENZENE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE WIDESPREAD. BASED ON THE ANALYSIS PERFORMED, BETWEEN 75 % AND 90 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE PROJECTED AMOUNT OF DISSOLVED TETRACHLOROBENZENE IN A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, RANGING FROM 47 % TO 86 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING TETRACHLOROBENZENE IS HIGH. CONCENTRATION IN THE SEDIMENT MAY BE 1175.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, BETWEEN 4.2 % AND 28 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING TETRACHLOROBENZENE IS SIGNIFICANT. BASED ON

THE ANALYSIS PERFORMED, APPROXIMATELY .0015 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF TETRACHLOROBENZENE IN FISH MAY BE 334.9 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS SIGNIFICANT RANGING FROM 10 % TO 25 %.

MOVEMENT OF TETRACHLOROBENZENE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 48 % AND 60 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE PROJECTED AMOUNT OF DISSOLVED TETRACHLOROBENZENE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 47 % TO 60 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS HIGH. BASED ON THE ANALYSIS PERFORMED, BETWEEN 4.5 % AND 37 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 1175.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING TETRACHLOROBENZENE IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0038 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF TETRACHLOROBENZENE IN FISH MAY BE 334.9 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 16 % TO 36 %.

MOVEMENT OF TETRACHLOROBENZENE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 23 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE PROJECTED AMOUNT OF DISSOLVED TETRACHLOROBENZENE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS SIGNIFICANT, WITH APPROXIMATELY 39 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS HIGH. CONCENTRATION IN THE SEDIMENT MAY BE 1175.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, BETWEEN 4.5 % AND 37 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT TETRACHLOROBENZENE LOADS IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0031 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF TETRACHLOROBENZENE IN FISH MAY BE 334.9 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS SIGNIFICANT, RANGING FROM 39 % TO 72 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- TETRACHLOROBENZENE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	6.0	1
RATIO OF MOLECULAR WEIGHTS OF TETRACHLOROBENZENE TO OXYGEN	6.7	2
OCTANOL/WATER PARTITION COEFFICIENT	4700	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATES A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF TETRACHLOROBENZENE

1 Weast, R. C., Editor, CRC Handbook of Physics and Chemistry, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-170.

2 Kenaga, E. E., and C. A. I. Goring, "Relationship Between Water Solubility, Soil Sorption, Octanol-Water Partitioning, and Bioconcentration of Chemicals in Biota," ASTM Third Aquatic Toxicology Symposium, New Orleans, October 17 and 18, 1978.

3 Kenaga, E. E., and C. A. I. Goring, "Relationship Between Water Solubility, Soil Sorption, Octanol-Water Partitioning, and Bioconcentration of Chemicals in Biota," ASTM Third Aquatic Toxicology Symposium, New Orleans, October 17 and 18, 1978.

TETRACHLOROETHANE

THE POTENTIAL RELEASE RATES OF TETRACHLOROETHANE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF TETRACHLOROETHANE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF TETRACHLOROETHANE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~.
ATTACHMENT 1.

TETRACHLOROETHANE WAS FOUND TO BE THE MAJOR CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 6800000 MG PER SQUARE METER OF SURFACE AREA PER YEAR TO 27000000 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LANDFILLS AND .00 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS. TETRACHLOROETHANE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 1.5 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 6.0 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 22 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO TETRACHLOROETHANE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL

PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF TETRACHLOROETHANE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~, ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF TETRACHLOROETHANE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 33 % AND 76 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 24 % TO 67 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED TETRACHLOROETHANE IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 31 % TO 75 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING TETRACHLOROETHANE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 99.5 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .31 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING TETRACHLOROETHANE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00023 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF TETRACHLOROETHANE IN FISH MAY BE 52.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS SIGNIFICANT RANGING FROM 24 % TO 67 %.

MOVEMENT OF TETRACHLOROETHANE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 39 % AND 49 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS SIGNIFICANT RANGING FROM 46 % TO 61 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED TETRACHLOROETHANE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 39 % TO 49 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .39 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 99.5 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING TETRACHLOROETHANE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00039 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF TETRACHLOROETHANE IN FISH MAY BE 52.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 41 % TO 57 %.

MOVEMENT OF TETRACHLOROETHANE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 11 % AND 18 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , RANGING FROM 77 % TO 89 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED TETRACHLOROETHANE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS SIGNIFICANT, RANGING FROM 77 % TO 89 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 99.5 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .40 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT TETRACHLOROETHANE LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00023 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF TETRACHLOROETHANE IN FISH MAY BE 52.6 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS HIGH, RANGING FROM 71 % TO 85 %.

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----- TETRACHLOROETHANE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	45000	1
RATIO OF MOLECULAR WEIGHTS OF TETRACHLOROETHANE TO OXYGEN	5.2	2
OCTANOL/WATER PARTITION COEFFICIENT	400	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	.0010	4
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.0010	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF TETRACHLOROETHANE

THE FOLLOWING TABLE PROVIDES EXAMPLES OF ACTUAL DATA, FROM CHEMICAL ANALYSIS, LISTED IN EPA'S DISTRIBUTION REGISTER OF ORGANIC POLLUTANTS IN WATER (WATER DROP) AS DESCRIBED BY GARRISON ET. AL. (1979). DATA ARE LISTED FOR ONLY THE CATEGORIES RAW DRINKING WATER, FINISHED DRINKING WATER, SURFACE WATER AND WELL WATER.

REPORTED OBSERVATIONS OF

TETRACHLOROETHANE

IN MAJOR MEDIA CATEGORIES

SAMPLE DESCRIPTION	MAXIMUM CONCENTRATION REPORTED, (UG/L)	REFERENCE
DRINKING WATER, FINISHED	2	1

1. MONITORING TO DETECT PREVIOUSLY UNRECOGNIZED POLLUTANTS IN SURFACE WATERS, OFFICE OF TOXIC SUBSTANCES, U.S. ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. 20460, EPA-560/6-77-015, JULY 1977, 375 PP, NTIS

1 Fazzalari, F. A., Editor, 1978, Compilation of Odor and Taste Threshold Values Data, American Society for Testing and Materials, Philadelphia, PA.

2 Neely, W. B., "Persistence Protocol Project," Workshop on Persistence for the National Research Council, Ottawa, Canada, April 1978.

3 Criteria Document prepared for Priority Pollutants per Section 307 of the Federal Water Pollution Control Act and the Clean Water Act as amended under contract for the U.S. EPA.

4 Criteria Document prepared for Priority Pollutants per Section 307 of the Federal Water Pollution Control Act and the Clean Water Act as amended under contract for the U.S. EPA.

TETRACHLORONITROBENZENE

THE POTENTIAL RELEASE RATES OF TETRACHLORONITROBENZENE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF TETRACHLORONITROBENZENE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF TETRACHLORONITROBENZENE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~.
ATTACHMENT 1.

TETRACHLORONITROBENZENE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM .012 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO .048 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND .18 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO TETRACHLORONITROBENZENE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF TETRACHLORONITROBENZENE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE

SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ATTACHMENT 1. ~~APPENDIX A~~. BECAUSE NO DEGRADATION DATA WERE AVAILABLE, THE RESULTS OF THE ANALYSIS SUBSEQUENTLY PRESENTED PROVIDES ESTIMATES OF THE RELATIVE PARTITIONING ONLY BETWEEN AIR, WATER, AND SEDIMENT MEDIA.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF TETRACHLORONITROBENZENE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE WIDESPREAD. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 83 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE PROJECTED AMOUNT OF DISSOLVED TETRACHLORONITROBENZENE IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 12 % TO 55 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING TETRACHLORONITROBENZENE IS HIGH. CONCENTRATION IN THE SEDIMENT MAY BE 12500.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, BETWEEN 29 % AND 73 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE

POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING TETRACHLORONITROBENZENE IS HIGH. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0059 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF TETRACHLORONITROBENZENE IN FISH MAY BE 1972.8 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS SIGNIFICANT WITH APPROXIMATELY 15 %.

MOVEMENT OF TETRACHLORONITROBENZENE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 9.6 % AND 29 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE PROJECTED AMOUNT OF DISSOLVED TETRACHLORONITROBENZENE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 8.1 % TO 27 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS HIGH. BASED ON THE ANALYSIS PERFORMED, BETWEEN 32 % AND 85 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 12500.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING TETRACHLORONITROBENZENE IS HIGH. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .010 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF TETRACHLORONITROBENZENE IN FISH MAY BE 1972.8 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 6.8 % TO 40 %.

MOVEMENT OF TETRACHLORONITROBENZENE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 3.1 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE PROJECTED AMOUNT OF DISSOLVED TETRACHLORONITROBENZENE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 12 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS HIGH. CONCENTRATION IN THE SEDIMENT MAY BE 12500.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, BETWEEN 33 % AND 86 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT TETRACHLORONITROBENZENE LOADS IS HIGH. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0060 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF TETRACHLORONITROBENZENE IN FISH MAY BE 1972.8 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS SIGNIFICANT, RANGING FROM 12 % TO 60 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- TETRACHLORONITROBENZENE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	10	1
RATIO OF MOLECULAR WEIGHTS OF TETRACHLORONITROBENZENE TO OXYGEN	8.2	2
OCTANOL/WATER PARTITION COEFFICIENT	50000	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATES A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF TETRACHLORONITROBENZENE

THE FOLLOWING TABLE PROVIDES EXAMPLES OF ACTUAL DATA, FROM CHEMICAL ANALYSIS, LISTED IN EPA'S DISTRIBUTION REGISTER OF ORGANIC POLLUTANTS IN WATER (WATER DROP) AS DESCRIBED BY GARRISON ET. AL. (1979). DATA ARE LISTED FOR ONLY THE CATEGORIES RAW DRINKING WATER, FINISHED DRINKING WATER, SURFACE WATER AND WELL WATER.

REPORTED OBSERVATIONS OF

1,1,2,2-TETRACHLOROETHANE

IN MAJOR MEDIA CATEGORIES

SAMPLE DESCRIPTION	MAXIMUM CONCENTRATION REPORTED, (UG/L)	REFERENCE
DRINKING WATER, FINISHED	2	1
SURFACE WATER	9	2

1. MONITORING TO DETECT PREVIOUSLY UNRECOGNIZED POLLUTANTS IN SURFACE WATERS, OFFICE OF TOXIC SUBSTANCES, U.S. ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. 20460,EPA-560/6-77-015, JULY 1977, 375 PP, NTIS

2. MONITORING TO DETECT PREVIOUSLY UNRECOGNIZED POLLUTANTS IN SURFACE WATERS, OFFICE OF TOXIC SUBSTANCES, U.S. ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. 20460,EPA-560/6-77-015, JULY 1977, 375 PP, NTIS

1 Weast, R. C., Editor, CRC Handbook of Physics and Chemistry, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-169.

2 Dawson, G. W., English, C. J., Petty, S. E., Best estimate by Battelle Northwest.

3 Dawson, G. W., English, C. J., Petty, S. E., Best estimate by Battelle Northwest.

TETRACHLOROPHENOL

THE POTENTIAL RELEASE RATES OF TETRACHLOROPHENOL FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF TETRACHLOROPHENOL THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF TETRACHLOROPHENOL CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT I.

TETRACHLOROPHENOL WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM .0050 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO .020 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND .074 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO TETRACHLOROPHENOL THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF TETRACHLOROPHENOL THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF

THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF TETRACHLOROPHENOL DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE WIDESPREAD. BASED ON THE ANALYSIS PERFORMED, BETWEEN 80 % AND 94 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 5.7 % TO 20 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED TETRACHLOROPHENOL IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 5.9 % TO 36 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING TETRACHLOROPHENOL IS HIGH. CONCENTRATION IN THE SEDIMENT MAY BE 30000.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, BETWEEN 45 % AND 88 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING TETRACHLOROPHENOL IS HIGH. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0076 % OF THE AMOUNT

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EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF TETRACHLOROPHENOL IN FISH MAY BE 3804.0 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS LOW WITH APPROXIMATELY 3.5 %.

MOVEMENT OF TETRACHLOROPHENOL THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 1.4 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS SIGNIFICANT RANGING FROM 7.6 % TO 44 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED TETRACHLOROPHENOL IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY 1.0 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS HIGH. BASED ON THE ANALYSIS PERFORMED, BETWEEN 50 % AND 91 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 30000.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING TETRACHLOROPHENOL IS HIGH. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0040 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF TETRACHLOROPHENOL IN FISH MAY BE 3804.0 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS LOW, WITH APPROXIMATELY .42 %.

MOVEMENT OF TETRACHLOROPHENOL THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .28 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS SIGNIFICANT , RANGING FROM 6.9 % TO 45 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED TETRACHLOROPHENOL IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH

APPROXIMATELY 6.9 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS HIGH. CONCENTRATION IN THE SEDIMENT MAY BE 30000.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, BETWEEN 53 % AND 93 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT TETRACHLOROPHENOL LOADS IS HIGH. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0023 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF TETRACHLOROPHENOL IN FISH MAY BE 3804.0 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS LOW, RANGING FROM .48 % TO 5.9 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- TETRACHLOROPHENOL -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	1000	1
RATIO OF MOLECULAR WEIGHTS OF TETRACHLOROPHENOL TO OXYGEN	7.2	2
OCTANOL/WATER PARTITION COEFFICIENT	120000	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.072	4

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF TETRACHLOROPHENOL

1 Weast, R. C., Editor, CRC Handbook of Physics and Chemistry, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-432.

2 Syracuse Univ. Res. Crop., 1973, Preliminary Environmental Hazard Assessment of Chlorinated Naphthalenes, Silicones, Fluorocarbons, Benzene Polycarboxylates, and Chlorophenols, prepared for EPA, NTIS PB-238 074.

3 Values of Kow were calculated using a computer routine developed at SRI by Johnson and Leibrand (1980) which uses group values reported by Hansch and Leo (1979).

4 Mabey, W. R., Mill, T., Hendry, D. G., Chou, T., Johnson, H. L., Best Judgement. SRI International.

TOLUENE

THE POTENTIAL RELEASE RATES OF TOLUENE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF TOLUENE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF TOLUENE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

TOLUENE WAS FOUND TO BE THE MAJOR CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 71000 MG PER SQUARE METER OF SURFACE AREA PER YEAR TO 280000 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LANDFILLS AND .00 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS. TOLUENE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 5.1 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO 20 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND 75 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO TOLUENE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF

RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF TOLUENE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT I. BECAUSE NO DEGRADATION DATA WERE AVAILABLE, THE RESULTS OF THE ANALYSIS SUBSEQUENTLY PRESENTED PROVIDES ESTIMATES OF THE RELATIVE PARTITIONING ONLY BETWEEN AIR, WATER, AND SEDIMENT MEDIA.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF TOLUENE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 6.7 % AND 52 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE PROJECTED AMOUNT OF DISSOLVED TOLUENE IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 6.6 % TO 52 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING TOLUENE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 29.4 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .064 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING TOLUENE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000077 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF TOLUENE IN FISH MAY BE 21.1 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS HIGH RANGING FROM 48 % TO 93 %.

MOVEMENT OF TOLUENE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 22 % AND 33 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE PROJECTED AMOUNT OF DISSOLVED TOLUENE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 22 % TO 33 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .11 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 29.4 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING TOLUENE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000089 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF TOLUENE IN FISH MAY BE 21.1 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 65 % TO 78 %.

MOVEMENT OF TOLUENE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 5.1 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED

OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE PROJECTED AMOUNT OF DISSOLVED TOLUENE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 89 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 29.4 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .12 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT TOLUENE LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000043 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF TOLUENE IN FISH MAY BE 21.1 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS HIGH, RANGING FROM 89 % TO 95 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- TOLUENE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	470	1
RATIO OF MOLECULAR WEIGHTS OF TOLUENE TO OXYGEN	2.9	2
OCTANOL/WATER PARTITION COEFFICIENT	120	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATES A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF TOLUENE

THE FOLLOWING TABLE PROVIDES EXAMPLES OF ACTUAL DATA, FROM CHEMICAL ANALYSIS, LISTED IN EPA'S DISTRIBUTION REGISTER OF ORGANIC POLLUTANTS IN WATER (WATER DROP) AS DESCRIBED BY GARRISON ET. AL. (1979). DATA ARE LISTED FOR ONLY THE CATEGORIES RAW DRINKING WATER, FINISHED DRINKING WATER, SURFACE WATER AND WELL WATER.

REPORTED OBSERVATIONS OF TOLUENE IN MAJOR MEDIA CATEGORIES

SAMPLE DESCRIPTION	MAXIMUM CONCENTRATION REPORTED, (UG/L)	REFERENCE
DRINKING WATER, FINISHED	12	1
SURFACE WATER	5	2

1. ANALYTICAL REPORT: NEW ORLEANS AREA WATER SUPPLY STUDY; EPA 906/9-75-003 UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, REGION VI, DALLAS, TX, DEC. 9, 1975, 95 PAGES,NTIS
2. MONITORING TO DETECT PREVIOUSLY UNRECOGNIZED POLLUTANTS IN SURFACE WATERS, OFFICE OF TOXIC SUBSTANCES, U.S. ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. 20460,EPA-560/6-77-015, JULY 1977, 375 PP, NTIS

Fazzalari, F. A., Editor, 1978, Compilation of Odor and Taste Threshold Values Data, American Society for Testing and Materials, Philadelphia, PA.

Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by the U.S. EPA.

Compilation of solvent water partition coefficients as reported in the literature. Developed and maintained by Dr. Corlan Hansch, Pomona College, Pomona, California.

TOXAPHENE

The potential release rates of TOXAPHENE from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of TOXAPHENE that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of TOXAPHENE can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1.

TOXAPHENE was found to be the major contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from 450 mg per square meter of surface area per year to 1800 mg per square meter of surface area per year for landfills and ,00 mg per square meter of surface area per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to TOXAPHENE through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of TOXAPHENE that determine its movement and degredation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of TOXAPHENE downstream from points of discharge in rivers is projected to be widespread. Based on the analysis performed, approximately 100 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The potential for degradation or elimination of this compound from a river reach traversed in 5 days is low, with approximately .23 % of the total amount emitted. The projected amount of dissolved TOXAPHENE in a river reach traversed in 5 days is high, ranging from 90 % to 99 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving TOXAPHENE is significant. Concentration in the sediment may be 206.3 times as great as ambient water concentration. Based on the analysis performed, between .86 % and 9.3 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving TOXAPHENE is low. Based on the analysis performed, approximately .00045 % of the amount emitted will be taken up by fish. Concentrations of TOXAPHENE in fish may be 90.8 times as great as dissolved concentrations. virtually no releases from the rivers to the atmosphere should occur.

Movement of TOXAPHENE through ponds and small reservoirs is projected to be widespread. Based on the analysis performed, between 87 % and 95 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The potential for degradation or elimination of this compound in such a pond is low with approximately 4.3 % of the total amount emitted. The projected amount of dissolved TOXAPHENE in a pond characterized by a retention time of 100 days is high, ranging from 86 % to 94 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is significant. Based on the analysis performed, between .85 % and 9.3 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 206.3 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving TOXAPHENE is low. Based on the analysis performed, approximately .0016 % of the amount emitted will be taken up by fish. Concentrations of TOXAPHENE in fish may be 90.8 times as great as dissolved concentrations. Virtually no releases from the ponds to the atmosphere should occur.

Movement of TOXAPHENE through reservoirs and lakes is projected to be widespread. Based on the analysis performed, between 77 % and 84 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The potential for degradation or elimination of this compound in such a reservoir or lake is significant , with approximately 14 % of the total amount emitted. The projected amount of dissolved TOXAPHENE in a reservoir or lake characterized by a retention time of 365 days is high, ranging from 14 % to 15 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is significant. Concentration in the sediment may be 206.3 times as great as ambient water concentration. Based on the analysis performed, between .85 % and 9.3

% of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant TOXAPHENE loads is low. Based on the analysis performed, approximately .0031 % of the amount emitted will be taken up by fish. Concentrations of TOXAPHENE in fish may be 90.8 times as great as dissolved concentrations. Virtually no releases from the reservoirs or lakes to the atmosphere should occur.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- TOXAPHENE -----

Parameter	Value	Referen
Solubility (mg/l)	3.0	1
Ratio of molecular weights of TOXAPHENE to oxygen	13	2
Octanol/Water Partition Coefficient	830	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	n.a.	
Microbial degradation rate constant (/days)	n.a.	
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	.00050	4

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicate a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of TOXAPHENE

1 Chemical Week Pesticides Register.

2 Chemical Week Pesticides Register.

3 Criteria Document prepared for Priority Pollutants per Section 307 of the Federal Water Pollution Control Act and the Clean Water Act as amended under contract for the U.S. EPA.

4 Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by the U.S. EPA.

TRICHLOROBENZENE

THE POTENTIAL RELEASE RATES OF TRICHLOROBENZENE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF TRICHLOROBENZENE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF TRICHLOROBENZENE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT I.

TRICHLOROBENZENE WAS FOUND TO BE THE MAJOR CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM 4500 MG PER SQUARE METER OF SURFACE AREA PER YEAR TO 18000 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LANDFILLS AND .00 MG PER SQUARE METER OF SURFACE AREA PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS. TRICHLOROBENZENE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE FROM .040 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR TO .16 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND .59 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY 100 % OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO TRICHLOROBENZENE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL

PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF TRICHLOROBENZENE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~ ATTACHMENT I. BECAUSE NO DEGRADATION DATA WERE AVAILABLE, THE RESULTS OF THE ANALYSIS SUBSEQUENTLY PRESENTED PROVIDES ESTIMATES OF THE RELATIVE PARTITIONING ONLY BETWEEN AIR, WATER, AND SEDIMENT MEDIA.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF TRICHLOROBENZENE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 51 % AND 67 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE PROJECTED AMOUNT OF DISSOLVED TRICHLOROBENZENE IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 18 % TO 58 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING TRICHLOROBENZENE IS HIGH. CONCENTRATION IN THE SEDIMENT MAY BE 3750.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, BETWEEN 9.1 % AND 33 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING TRICHLOROBENZENE IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0028 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF TRICHLOROBENZENE IN FISH MAY BE 799.7 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS SIGNIFICANT RANGING FROM 33 % TO 49 %.

MOVEMENT OF TRICHLOROBENZENE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 16 % AND 25 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE PROJECTED AMOUNT OF DISSOLVED TRICHLOROBENZENE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 15 % TO 25 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS HIGH. BASED ON THE ANALYSIS PERFORMED, BETWEEN 13 % AND 64 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 3750.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING TRICHLOROBENZENE IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0038 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF TRICHLOROBENZENE IN FISH MAY BE 799.7 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 21 % TO 62 %.

MOVEMENT OF TRICHLOROBENZENE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 4.8 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE PROJECTED AMOUNT OF DISSOLVED TRICHLOROBENZENE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 31 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS HIGH. CONCENTRATION IN THE SEDIMENT MAY BE 3750.0 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, BETWEEN 13 % AND 65 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT TRICHLOROBENZENE LOADS IS SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .0020 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF TRICHLOROBENZENE IN FISH MAY BE 799.7 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS HIGH, RANGING FROM 31 % TO 81 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- TRICHLOROBENZENE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	30	1
RATIO OF MOLECULAR WEIGHTS OF TRICHLOROBENZENE TO OXYGEN	5,7	2
OCTANOL/WATER PARTITION COEFFICIENT	15000	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATES A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF TRICHLOROBENZENE

Weast, R. C., Editor, CRC Handbook of Physics and Chemistry, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-171.

Kenaga, E. E., and C. A. I. Goring, "Relationship Between Water Solubility, Soil Sorption, Octanol-Water Partitioning, and Bioconcentration of Chemicals in Biota," ASTM Third Aquatic Toxicology Symposium, New Orleans, October 17 and 18, 1978.

Kenaga, E. E., and C. A. I. Goring, "Relationship Between Water Solubility, Soil Sorption, Octanol-Water Partitioning, and Bioconcentration of Chemicals in Biota," ASTM Third Aquatic Toxicology Symposium, New Orleans, October 17 and 18, 1978.

TRICHLOROETHANE

THE POTENTIAL RELEASE RATES OF TRICHLOROETHANE FROM STORAGE, TREATMENT, OR DISPOSAL SITES DEPEND UPON ITS CHEMICAL PROPERTIES; THE TYPE, LOCATION, DESIGN AND MANAGEMENT OF THE STORAGE, TREATMENT, OR DISPOSAL SYSTEM; AND THE ENVIRONMENTAL CHARACTERISTICS OF THE RELEASE SITE. THE ESTIMATED POTENTIAL RELEASE RATES PRESENTED HERE ARE BASED ON AN EVALUATION OF PROPERTIES OF TRICHLOROETHANE THAT DETERMINE ITS MOVEMENT FROM UNCONFINED LANDFILLS AND LAGOONS AND ON AN ESTIMATION OF PARAMETERS THAT REFLECT POSSIBLE LANDFILL AND LAGOON CONFIGURATIONS. THE ESTIMATED POTENTIAL RELEASE RATES OF TRICHLOROETHANE CAN BE USED TO ASSESS THE MAGNITUDE OF ITS POTENTIAL TO CONTAMINATE GROUNDWATER AND AS SOURCES FOR THE AQUATIC EXPOSURE ASSESSMENT INCLUDED IN THIS REPORT. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

TRICHLOROETHANE WAS FOUND TO BE A CONTAMINANT IN AT LEAST ONE WASTE STREAM. THE UNIT RELEASE RATE TO SURFACE WATERS WAS ESTIMATED TO BE APPROXIMATELY .00 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LANDFILLS AND .00000000 MG PER SQUARE METER OF SURFACE AREA PER FRACTION OF THE WASTE STREAM PER YEAR FOR LAGOONS. APPROXIMATELY .00 % OF THE MATERIAL EMITTED FROM A LANDFILL IS ESTIMATED TO REACH SURFACE WATERS. APPROXIMATELY .00000000% OF THE MATERIAL EMITTED FROM A LAGOON IS ESTIMATED TO REACH SURFACE WATERS.

POTENTIAL HUMAN AND ENVIRONMENTAL EXPOSURE TO TRICHLOROETHANE THROUGH CONTACT WITH OR CONSUMPTION OF CONTAMINATED WATER DEPENDS UPON ITS CHEMICAL PROPERTIES, ITS RELEASE RATE, THE DISTRIBUTION OF RELEASES, AND THE ENVIRONMENTAL CHARACTERISTICS OF RECEIVING WATER BODIES. THE ESTIMATED POTENTIAL FOR EXPOSURE VIA AQUATIC MEDIA PRESENTED HERE IS BASED ON EVALUATION OF PROPERTIES OF TRICHLOROETHANE THAT DETERMINE ITS MOVEMENT AND DEGREDATION IN RECEIVING WATER BODIES AND ON AN ESTIMATION OF PARAMETERS WHICH REFLECT CONDITIONS COMMON TO A WIDE VARIETY OF RECEIVING WATERS. THE ACCOMPANYING TABLE SUMMARIZES DATA USED IN THE EVALUATION. A DETAILED DESCRIPTION OF THE ANALYSIS PROCEDURE IS CONTAINED IN ~~APPENDIX A~~. ATTACHMENT 1.

POTENTIAL EXPOSURE CAN BE ESTIMATED USING SEVERAL KEY PARAMETERS. THE FRACTIONAL AMOUNT TRANSPORTED INDICATES HOW WIDESPREAD POTENTIAL CONTAMINATION MAY BE. CONVERSELY, THE FRACTIONAL AMOUNT DEGRADED OR ELIMINATED GIVES AN INDICATION OF THE CAPACITY OF THE AQUATIC SYSTEM TO REMOVE A SUBSTANCE BY DEGRADATION PROCESSES BEFORE TRANSPORT OF THE SUBSTANCE BECOMES WIDESPREAD. THE FRACTIONAL AMOUNT DISSOLVED IS AN INDICATOR OF THE AMOUNT OF A TOXIC SUBSTANCE TO WHICH BIOTA ARE IMMEDIATELY EXPOSED AND IS ALSO AN INDICATOR OF POTENTIAL DRINKING WATER CONTAMINATION. THE FRACTIONAL AMOUNT ADSORBED AND THE RATIO OF THE CONCENTRATION IN SEDIMENT TO CONCENTRATION IN WATER ARE INDICATORS OF HOW SEVERELY SEDIMENTS MAY BE CONTAMINATED AND CONSEQUENTLY WHAT THE POTENTIAL EXPOSURE OF BENTHIC ORGANISMS AND BOTTOM FEEDING FISH MAY BE. THE FRACTIONAL AMOUNT BIOACCUMULATED AND THE RATIO OF THE CONCENTRATION IN FISH TISSUE TO CONCENTRATION IN WATER ARE INDICATORS OF POTENTIAL EXPOSURES THROUGH TRANSFER UP THE FOOD CHAIN.

MOVEMENT OF TRICHLOROETHANE DOWNSTREAM FROM POINTS OF DISCHARGE IN RIVERS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 11 % AND 57 % OF THE AMOUNT EMITTED INTO THE RIVER WILL BE TRANSPORTED A DISTANCE OF 5 DAYS TRAVEL TIME (APPROXIMATELY 50 TO 250 MILES). THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND FROM A RIVER REACH TRAVERSED IN 5 DAYS IS HIGH, RANGING FROM 43 % TO 89 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED TRICHLOROETHANE IN A RIVER REACH TRAVERSED IN 5 DAYS IS SIGNIFICANT, RANGING FROM 10 % TO 57 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF BOTTOM SEDIMENTS DEPOSITED IN RIVER REACHES RECEIVING TRICHLOROETHANE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 39.6 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .095 % OF THE AMOUNT EMITTED WILL BE SORBED TO SUSPENDED SEDIMENTS CONTAINED WITHIN A RIVER REACH TRAVERSED IN 5 DAYS(50 TO 250 MILES). THE POTENTIAL FOR BIOACCUMULATION IN RIVER REACHES RECEIVING TRICHLOROETHANE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00010 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF TRICHLOROETHANE IN FISH MAY BE 26.4 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED

POTENTIAL RELEASE TO THE ATMOSPHERE FROM A RIVER REACH TRAVERSED IN 5 DAYS (50 TO 250 MILES) IS HIGH RANGING FROM 41 % TO 89 %.

MOVEMENT OF TRICHLOROETHANE THROUGH PONDS AND SMALL RESERVOIRS IS PROJECTED TO BE SIGNIFICANT. BASED ON THE ANALYSIS PERFORMED, BETWEEN 23 % AND 33 % OF THE AMOUNT EMITTED INTO A POND WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 100 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A POND IS SIGNIFICANT RANGING FROM 66 % TO 77 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED TRICHLOROETHANE IN A POND CHARACTERIZED BY A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 23 % TO 33 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF PONDS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .15 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A POND CHARACTERIZED BY AN AVERAGE RETENTION TIME OF 100 DAYS. CONCENTRATION IN THE SEDIMENT MAY BE 39.6 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. THE POTENTIAL FOR BIOACCUMULATION IN PONDS RECEIVING TRICHLOROETHANE IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .00012 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF TRICHLOROETHANE IN FISH MAY BE 26.4 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE TO THE ATMOSPHERE FROM A POND SURFACE WITH A RETENTION TIME OF 100 DAYS IS SIGNIFICANT, RANGING FROM 53 % TO 68 %.

MOVEMENT OF TRICHLOROETHANE THROUGH RESERVOIRS AND LAKES IS PROJECTED TO BE LIMITED. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY 5.6 % OF THE AMOUNT EMITTED INTO A RESERVOIR OR LAKE WILL BE TRANSPORTED OUT ASSUMING AN AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR DEGRADATION OR ELIMINATION OF THIS COMPOUND IN SUCH A RESERVOIR OR LAKE IS HIGH , RANGING FROM 88 % TO 94 % OF THE TOTAL AMOUNT EMITTED. THE PROJECTED AMOUNT OF DISSOLVED TRICHLOROETHANE IN A RESERVOIR OR LAKE CHARACTERIZED BY A RETENTION TIME OF 365 DAYS IS LOW, WITH APPROXIMATELY 88 % OF THE TOTAL AMOUNT EMITTED.

THE POTENTIAL FOR CONTAMINATION OF SEDIMENTS THAT ACCUMULATE AT THE BOTTOM OF A RESERVOIR OR LAKE IS LOW. CONCENTRATION IN THE SEDIMENT MAY BE 39.6 TIMES AS GREAT AS AMBIENT WATER CONCENTRATION. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .16 % OF THE AMOUNT EMITTED WILL BE SORBED TO SEDIMENTS CONTAINED WITHIN A RESERVOIR OR LAKE WITH AVERAGE RETENTION TIME OF 365 DAYS. THE POTENTIAL FOR BIOACCUMULATION IN LAKES AND RESERVOIRS RECEIVING SIGNIFICANT TRICHLOROETHANE LOADS IS LOW. BASED ON THE ANALYSIS PERFORMED, APPROXIMATELY .000059 % OF THE AMOUNT EMITTED WILL BE TAKEN UP BY FISH. CONCENTRATIONS OF TRICHLOROETHANE IN FISH MAY BE 26.4 TIMES AS GREAT AS DISSOLVED CONCENTRATIONS. ESTIMATED POTENTIAL RELEASE FROM A RESERVOIR OR LAKE WITH AN AVERAGE RETENTION TIME OF 365 DAYS IS HIGH, RANGING FROM 75 % TO 86 %.

NOTE: THE APPENDIX REFERRED TO IN THE ABOVE TEXT IS ENTITLED, "TECHNICAL SUPPORT DOCUMENT FOR AQUATIC FATE AND TRANSPORT ESTIMATES FOR HAZARDOUS CHEMICAL EXPOSURE ASSESSMENTS".

----- TRICHLOROETHANE -----

PARAMETER	VALUE	REFEREN
SOLUBILITY (MG/L)	950	1
RATIO OF MOLECULAR WEIGHTS OF TRICHLOROETHANE TO OXYGEN	4.2	2
OCTANOL/WATER PARTITION COEFFICIENT	160	3
ALKALINE HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
ACID HYDROLYSIS RATE CONSTANT (/DAYS)	N.A.	
HYDROLYSIS RATE CONSTANT (/DAYS)	.0038	4
MICROBIAL DEGRADATION RATE CONSTANT (/DAYS)	N.A.	
PHOTOLYSIS RATE CONSTANT (/DAYS)	N.A.	
OXIDATION RATE CONSTANT (/DAYS)	N.A.	
OVERALL DEGRADATION RATE CONSTANT (/DAYS)	.0038	

IF DATA IS NOT AVAILABLE COLUMN CONTAINS 'N.A.'

OVERALL DEGRADATION RATE CONSTANTS WERE ESTIMATED CONSIDERING OXIDATION, HYDROLYTIC, PHOTOLYTIC AND MICROBIAL DEGRADATION PROCESSES. IN SOME CASES DEGRADATION INFORMATION WAS NOT SPECIFIC ENOUGH TO ASSIGN A RATE COEFFICIENT FOR EACH INDIVIDUAL PROCESS. IN OTHER CASES, NO DATA INDICATE A PARTICULAR PROCESS CONTRIBUTES TO SUBSTANTIAL REMOVAL OF THE SUBSTANCE FROM AQUATIC SYSTEMS. FOR THESE SITUATIONS AN N.A. DESIGNATION WAS ASSIGNED TO THE SPECIFIC PROCESS RATE COEFFICIENT.

TABLE OF CHEMICAL PROPERTIES USED IN ESTIMATING THE PERSISTENCE OF TRICHLOROETHANE

1 Weast, R. C., Editor, CRC Handbook of Physics and Chemistry, 59th Edition, CRC Press, West Palm Beach, Fla., (1979), p. C-294.

2 Neely, W. B., "Persistence Protocol Project," Workshop on Persistence for the National Research Council, Ottawa, Canada, April 1978.

3 Strier, M. P., Pollutant Treatability: A MOlecular Engineering Approach, Environmental Science and Technology, vol. 14, No. 1, January 1980, pp. 28-31.

4 Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) files maintained by the U.S. EPA.

TRINITROBENZENE

The potential release rates of TRINITROBENZENE from storage, treatment, or disposal sites depend upon its chemical properties; the type, location, design and management of the storage, treatment, or disposal system; and the environmental characteristics of the release site. The estimated potential release rates presented here are based on an evaluation of properties of TRINITROBENZENE that determine its movement from unconfined landfills and lagoons and on an estimation of parameters that reflect possible landfill and lagoon configurations. The estimated potential release rates of TRINITROBENZENE can be used to assess the magnitude of its potential to contaminate groundwater and as sources for the aquatic exposure assessment included in this report. A detailed description of the analysis procedure is contained in ~~Appendix A~~. Attachment 1.

TRINITROBENZENE was found to be a contaminant in at least one waste stream. The unit release rate to surface waters was estimated to be from 26 mg per square meter of surface area per fraction of the waste stream per year to 100 mg per square meter of surface area per fraction of the waste stream per year for landfills and 380 mg per square meter of surface area per fraction of the waste stream per year for lagoons. Approximately 100 % of the material emitted from a landfill is estimated to reach surface waters. Approximately 100 % of the material emitted from a lagoon is estimated to reach surface waters.

Potential human and environmental exposure to TRINITROBENZENE through contact with or consumption of contaminated water depends upon its chemical properties, its release rate, the distribution of releases, and the environmental characteristics of receiving water bodies. The estimated potential for exposure via aquatic media presented here is based on evaluation of properties of TRINITROBENZENE that determine its movement and degredation in receiving water bodies and on an estimation of parameters which reflect conditions common to a wide variety of receiving waters. The accompanying table summarizes data used in the evaluation. A detailed description of the analysis procedure is contained in Attachment 1. ~~Appendix A~~. Because no degradation data were available, the results of the analysis subsequently presented provides estimates of the relative partitioning only between air, water, and sediment media.

Potential exposure can be estimated using several key parameters. The fractional amount transported indicates how widespread potential contamination may be. Conversely, the fractional amount degraded or eliminated gives an indication of the capacity of the aquatic system to remove a substance by degradation processes before transport of the substance becomes widespread. The fractional amount dissolved is an indicator of the amount of a toxic substance to which biota are immediately exposed and is also an indicator of potential drinking water contamination. The fractional amount adsorbed and the ratio of the concentration in sediment to concentration in water are indicators of how severely sediments may be contaminated and consequently what the potential exposure of benthic organisms and bottom feeding fish may be. The fractional amount bioaccumulated and the ratio of the concentration in fish tissue to concentration in water are indicators of potential exposures through transfer up the food chain.

Movement of TRINITROBENZENE downstream from points of discharge in rivers is projected to be widespread. Based on the analysis performed, approximately 97 % of the amount emitted into the river will be transported a distance of 5 days travel time (approximately 50 to 250 miles). The projected amount of dissolved TRINITROBENZENE in a river reach traversed in 5 days is high, with approximately 96 % of the total amount emitted.

The potential for contamination of bottom sediments deposited in river reaches receiving TRINITROBENZENE is low. Concentration in the sediment may be 5.9 times as great as ambient water concentration. Based on the analysis performed, approximately .024 % of the amount emitted will be sorbed to suspended sediments contained within a river reach traversed in 5 days(50 to 250 miles). The potential for bioaccumulation in river reaches receiving TRINITROBENZENE is low. Based on the analysis performed, approximately .000031 % of the amount emitted will be taken up by fish. Concentrations of TRINITROBENZENE in fish may be 6.3 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a river reach traversed in 5 days (50 to 250 miles) is low with approximately .82 %.

Movement of TRINITROBENZENE through ponds and small reservoirs is projected to be widespread. Based on the analysis performed, approximately 96 % of the amount emitted into a pond will be transported out assuming an average retention time of 100 days. The projected amount of dissolved TRINITROBENZENE in a pond characterized by a retention time of 100 days is high, with approximately 96 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of ponds is low. Based on the analysis performed, approximately .024 % of the amount emitted will be sorbed to sediments contained within a pond characterized by an average retention time of 100 days. Concentration in the sediment may be 5.9 times as great as ambient water concentration. The potential for bioaccumulation in ponds receiving TRINITROBENZENE is low. Based on the analysis performed, approximately .00011 % of the amount emitted will be taken up by fish. Concentrations of TRINITROBENZENE in fish may be 6.3 times as great as dissolved concentrations. Estimated potential release to the atmosphere from a pond surface with a retention time of 100 days is low, with approximately 2.4 %.

Movement of TRINITROBENZENE through reservoirs and lakes is projected to be widespread. Based on the analysis performed, between 81 % and 89 % of the amount emitted into a reservoir or lake will be transported out assuming an average retention time of 365 days. The projected amount of dissolved TRINITROBENZENE in a reservoir or lake characterized by a retention time of 365 days is high, ranging from 10 % to 19 % of the total amount emitted.

The potential for contamination of sediments that accumulate at the bottom of a reservoir or lake is low. Concentration in the sediment may be 5.9 times as great as ambient water concentration. Based on the analysis performed, approximately .024 % of the amount emitted will be sorbed to sediments contained within a reservoir or lake with average retention time of 365 days. The potential for bioaccumulation in lakes and reservoirs receiving significant TRINITROBENZENE loads is low. Based on the analysis performed, approximately .00020 % of the amount emitted will be taken up by fish. Concentrations of TRINITROBENZENE in fish may be 6.3 times as great as dissolved concentrations. Estimated potential release from a reservoir or lake with an average retention time of 365 days is significant, ranging from 10 % to 19 %.

Note: The Appendix referred to in the above text is entitled, "Technical Support Document for Aquatic Fate and Transport Estimates for Hazardous Chemical Exposure Assessments".

----- 5 TRINITROBENZENE -----

Parameter	Value	Referen
Solubility (mg/l)	350	1
Ratio of molecular weights of TRINITROBENZENE to oxygen	6.7	2
Octanol/Water Partition Coefficient	23	3
Alkaline hydrolysis rate constant (/days)	n.a.	
Acid hydrolysis rate constant (/days)	n.a.	
Hydrolysis rate constant (/days)	n.a.	
Microbial degradation rate constant (/days)	n.a.	
Photolysis rate constant (/days)	n.a.	
Oxidation rate constant (/days)	n.a.	
Overall degradation rate constant (/days)	n.a.	

If data is not available column contains 'n.a.'

Overall degradation rate constants were estimated considering oxidation, hydrolytic, photolytic and microbial degradation processes. In some cases degradation information was not specific enough to assign a rate coefficient for each individual process. In other cases, no data indicates a particular process contributes to substantial removal of the substance from aquatic systems. For these situations an n.a. designation was assigned to the specific process rate coefficient.

Table of Chemical Properties Used in Estimating the Persistence of TRINITROBENZENE

1 Perry, J. H., 1963, Chemical Engineer's Handbook, McGraw-Hill Book Company, New York, N.Y.

2 Mabey, W. R., Mill, T., Hendry, D. G., Chou, T., Johnson, H. L., Best Judgement, SRI International.

3 Values of Kow were calculated using a computer routine developed at SRI by Johnson and Leibrand (1980) which uses group values reported by Hansch and Leo (1979).

Attachment 1

The model used in the analysis is a simple mass balance of the pollutant. All degradation processes are assumed to be adequately approximated by first order rate equations, i.e.

$$R_i = k_i C \qquad (1)$$

where k_i = rate constant (days^{-1})

C = concentration of dissolved pollutant (ug/liter)

R_i = rate of change in concentration of pollutant concentration (ug/(liter . days))

Sorption of pollutant onto suspended matter is assumed to obtain an equilibrium partition instaneously and to be totally reversible. Furthermore, sorption is assumed to occur only on the organic fraction of the suspended sediment. A linear relationship between the dissolved pollutant concentration and sorbed pollutant concentration is used to describe the partitioning between water and sorbed phases.

$$C^S = KC \qquad (2)$$

where C^S = amount of sorbed pollutant per unit mass of sediment

K = sediment/water partition coefficient

Bioaccumulation of the pollutant in fish is assumed to obtain equilibrium partition such that the rate of removal from water can be expressed as

$$R_f = B_f * K^f . C \qquad (3)$$

K^f = fish tissue/water partition coefficient

B_f = biomass turnover rate $\left(\frac{\text{gm of tissue}}{\text{gm of water day}^{-1}}\right)$

In rivers, water, suspended sediment and pollutant are assumed to move in plug flow. The appropriate partial differential equation which describes pollutant transport and degradation is

$$(1 + KS)\frac{\partial C}{\partial t} = (1 + KS)\ v\frac{\partial C}{\partial x} - \sum_i k_i C \qquad (4)$$

For an initial condition $C = C_o$ at $t = o$, equation 4 can be solved to yield the following:

$$\frac{C}{C_o} = \exp\left\{-\frac{\sum\limits_i k_i t}{1 + KS}\right\} \qquad (5)$$

where v = average velocity of the water ($\frac{\text{meters}}{\text{day}}$)

x = distance (meters)

S = suspended sediment concentration ($\frac{\text{gm sediment}}{\text{gm } H_2O}$)

t = time of travel (days)

Equation 5 gives an estimate of the relative amount of material remaining at the end of travel time t and thus an estimate of the fraction of the initial material which is transported a distance of travel time t. The fraction of pollutant removed by the elimination processes is

$$f_e = 1 - \frac{C}{C_o} = 1 - \exp -\left\{\frac{\sum\limits_i k_i t}{1 + KS}\right\} \qquad (6)$$

The fraction of pollutant entering the water which is sorbed to suspended sediment at the end of travel time t is

$$f_s = \frac{KSC}{(1 + KS)}\frac{1}{C_o} = \frac{KS}{1 + KS} \exp -\left\{\frac{\sum\limits_i k_i t}{1 + KS}\right\} \qquad (7)$$

The fraction of pollutant entering the water which is dissolved at the end of travel time t is

$$f_o = \frac{C}{1 + KS}\ \frac{1}{C_o} = \frac{1}{1 + KS}\ \exp\left\{\frac{-\sum\limits_i k_i t}{1 + KS}\right\} \qquad (8)$$

The fraction of the pollutant eliminated by rate process j is

$$f_{rj} = \frac{\int_o^t kj\ C\ dt}{C_o} = \frac{kj(1+KS)}{(\sum\limits_i k_i)}\left\{1 - \exp -\left\{\frac{(\sum\limits_i k_i)t}{1 + KS}\right\}\right\} \qquad (9)$$

For all river calculations, we assumed a travel time of 5 days. The travel time was selected because it represents lengths of river reaches between 50 and 250 miles according to the velocities reported by Zison et. al. (1978). Contamination of this length of river reach was deemed to be significant.

For pollutant movement and degradation in ponds and lakes, we assumed a steady state mass balance in a well mixed water body adequately estimates transport and degradation phenomena. This steady state mass balance in equation form is

$$\dot{V} C^{T}_{in} = \dot{V} C^{T} + V \sum_{i} k_{i} C + D * V \qquad (10)$$

where C^{T}_{in} = total mass pollutant, dissolved and sorbed per unit volume of influent water.

C^{T} = total mass of pollutant, dissolved and sorbed per unit volume of intake and effluent water.

$\dot{V}$ = volume flowrate of water through the lake or pond.

V = volume of water in the lake or pond.

C = concentration of dissolved pollutant in the lake and lake effluent.

D = deposition rate of sorbed pollution per unit volume of water.

Solving equation 10 for the ratio of C^{T} to C_{in} yields

$$\frac{C^{T}}{C^{T}_{in}} = \frac{(KS + 1)\,(1 - D\, t/C^{T}_{in})}{t \sum_{i} k_{i} + KS + 1} \qquad (11)$$

where t = average residence time = $\frac{V}{\dot{V}}$

Furthermore, if we assume that the rate of deposition is proportional to inlet sorbed pollutant concentration,

$$D = N * C^{T}_{in} * \frac{\dot{V}}{V} * \frac{K * S_{in}}{1 + KS_{in}} \qquad (12)$$

where N = particulate trap efficience

S_{in} = sediment concentration in inlet water

If sorbed pollutant and sediment trapping coefficient are identical, the intake sediment concentration is related to S_{in} as follows:

$$S = (1 - N)S_{in} \tag{13}$$

Substituting equations 12 and 13 into equation 11 yield the result

$$\frac{C^T}{C^T_{in}} = \frac{(1 + KS)}{1 + KS + (\sum_i k_i)t} \left\{ 1 - \frac{KS * N}{1 - N + KS} \right\} \tag{14}$$

Simple algebraic operations give expressions for the following ratios:

$$f_e = \frac{(\sum_i k_i)t}{1 + KS + (\sum_i k_i)t} \left\{ 1 - \frac{KS * N}{1 - N + KS} \right\} \tag{15}$$

$$f_o = \frac{1}{1 + KS + (\sum_i k_i)t} \left\{ 1 - \frac{KS * N}{1 - N + KS} \right\} \tag{16}$$

$$f_s = \frac{KS}{1 + KS + (\sum_i k_i)t} \left\{ 1 - \frac{KS * N}{1 - N + KS} \right\} \tag{17}$$

and

$$f_{ri} = \frac{k_i t}{1 + KS + (\sum_i k_i)t} \left\{ 1 - \frac{KS * N}{1 - N + KS} \right\} \tag{18}$$

where

f_e = fraction of emitted that is degraded or eliminated.

f_o = fraction of emitted that is dissolved.

f_s = fraction of emitted that is sorbed.

and

f_{ri} = fraction of emitted that is degraded or eliminated by the ith process.

If standing fish crop, F, and biomass turnover rates are known, then we can use equation (3) to yield

$$f_f = \frac{k_f t}{1 + KS + (\sum_i k_i)t} \left\{ 1 - \frac{KS * N}{1 - N + KS} \right\} \tag{19}$$

where $k_f = K^f * B_f * F$

and f_f = fraction of emitted that is taken up by fish.

Characterization of Environments and Input Data

The environmental characteristics of rivers, ponds, and reservoirs must be established before the previous equations can be used. A summary of the relevant data for two cases within each water body is given in Table 1. These values are representative of typical water bodies throughout the country. A range was provided to give reasonable coverage of the possible configurations.

The reaeration rates given in Table 1 were taken directly from Zison et al (1978) or estimated based upon the following relationship:

$$Ko_2 = \frac{Do_2 * 10^6}{(200-60\sqrt{V_w})D}$$

where Do_2 = diffusivity of oxygen, meters/sec.

V_w = wind speed, m/sec.

D = depth, m.

ko_2 = reaeration rate, days^{-1}.

Reaeration rates were developed for the purpose of estimating pollutant volatilization rates, k_v. Smith et al (1977) have shown that

$$k_v = ko_2\ (D_m / Do_2)$$

where D_m = diffusivity of pollutant

Do_2 = diffusivity of oxygen

Similarly, Bird et al (1960) have shown that

$$k_v = ko_2\ (Mw_{o_2}/MW_p) ** 0.5$$

where MW_p = molecular weight of pollutant.

MW_{o_2} = molecular weight of oxygen.

Thus given values for reaeration, ko_2, we can estimate volatilization rate constants for each pollutant.

Note if the vapor pressure of a compound was less than 0.1 mm Hg, k_v was assumed to be zero. If an estimate of k_v was provided based on data, this value was used with appropriate adjustments for varying depth.

The bulk sediment concentration and the sediment organic matter content were combined to estimate the effective sediment concentration, S, used in the calculations. The bulk sediment concentrations represent a range of measured values observed in several U.S. rivers as reported by Gehm *et al* (1976). Few measurements of the organic matter content of sediments exist however. This required a means to estimate the sediment organic matter based upon the more commonly available data for soil organic matter. Estimates were made with the following equation:

$$y = \frac{x}{x + (1-x)e}$$

y = sediment organic matter fraction.

x = soil organic matter fraction.

e = transport efficiency of soil inorganic matter fraction.

Based upon observed data within the Yazoo River system e was calculated to be 0.0101. The equation could then be applied to the range of soil organic matter reported in McElroy *et al* (1976) and Buchman and Brady (1969). The sediment-pollutant partition coefficeint, K, is scaled to the pollutant-specific octanol-water partition coefficient by the simple relationship

$$K_{om} = 0.25\ K_{ow}$$

The fish growth rates reported in Table 1 were estimated by the product of the specific biomass growth rate, .01 day ** 0.5, suggested by Zison *et al* (1978) and typical standing fish crop values reported by Lagler as shown in Table 2. Because the values of Table 2 were given on an areal basis it was necessary to adjust for the depths chosen for each case.

The partition coefficient for the fish, Kf, was related to properties of the pollutant via the following equation from Neely (1976).

$$K^{f} = 0.59 * K_{ow} ** 0.75$$

Pollutant Loading Estimates

Estimates of pollutant loading to surface waters from landfills and storage lagoons were made for each compound. Because such sources will contain residuals from a waste stream having a complex mixture of individual compounds, we further estimated loadings for the major contaminant in a given waste stream as well as all other contaminants. To follow such a scheme we first developed a list which categorizes each compound as either the major contaminant in at least one waste stream or simply as a contaminant found in at least one waste stream. The list was developed by selecting the major contaminant where such data were available or by judgement based upon the properties of the compound and the waste stream or manufacturing process description.

The choice of a landfill and a lagoon as sources of contaminants to surface waters was not based upon consideration of waste treatment systems now in place or universally accepted but rather was selected as representative of potentially uncontrollable sources.

The unconfined landfill was assumed to be located 100 meters from a surface water body. We made the following assumptions:

- The mass of the contaminant in the landfill was sufficiently large to represent an infinite source. This is equivalent to assuming the filling rate is greater than or equal to the sum of the processes removing the contaminants from the landfill.

- The soil sorptive capacity has been reached in both the unsaturated and saturated zones. For the saturated zone an equivalent assumption would be a soil having no organic matter.

- The major contaminant of the waste stream will leach from the fill at its solubility limit but other contaminants will be subject to sorption within the waste residuals.

- The contaminants are permitted to chemically degrade in plug-flow transit from the landfill source to the surface water.

Given the above assumptions for the major contaminants we can write

$$\frac{d(RC^{i})}{dt} = k_{i}RC^{i}$$

where R = net recharge rate, m/yr-m^2
k_i = rate constant, yr ** -1.0
c_s^i = solubility of contaminant, i, mg/l
t = travel time, yr
c^i = concentration of contaminant, i, mg/l

which when solved yields:

$$F_u^i = 10^3 * R * C_s^i * e^{-k_i (100/R)} \qquad (20)$$

where F_u^i = unit flux of the major contaminant, i, mg/m^2-yr.

If pollutant, i, is not the major pollutant in the waste stream then equation (1) becomes

$$F_u^i = 10^3 * \frac{R}{K} * e^{-k_i(100/R)} \qquad (21)$$

where K = partition coefficient for organic matter

F_u^i = unit flux of the contaminant, i, mg/m^2-yr-F

R = recharge rate, flow rate

Note in equation (21) that the flux has been expressed as a rate per fraction, F, that the contaminant is found in the waste stream. Equations (21) and (22) were evaluated at net recharge rates of 0.15 to 0.6 m/yr. representing an expected range of percolation among combinations of soils, rainfall, and evapotranspiration as reported by Stewart et al (1976).

The lagoon of depth, H_1, of 2.4 m was assumed to be a distance, L, of 100 m from a surface water of depth H_2, of 1.2 m. The assumptions related to pollutant movement given for the landfill also apply for the lagoon. For the lagoon the flowrate, R, of equations (21) and (22) can be estimated as shown by Chow (1964) as

$$R = \frac{Kh}{2L} \left(H_1^2 - H_2^2\right) \qquad (22)$$

where Kh = saturated hydraulic conductivity, m/yr. A Kh of 96 m/yr as suggested for very fine sand by Linsley and Franzini (1964) yielding

$$F_u^i = 2.21 * 10^3 * C_s^i * \exp(-45.28\ k_i) \qquad (23)$$

where F_u^i = unit flux of the major contaminant, i, mg/m^2-yr.

Similarly for other contaminants we get

$$F_u^i = \frac{2.21 * 10^3}{K} * \exp(-45.28\ k_i) \qquad (24)$$

where F_U^i = unit flux of the contaminant, i, mg/m^2-yr-F

Qualitative Assessment Procedure

In assigning a qualitative assessment of the movement and degradation of compounds the following criteria were followed:

> If the fraction of material in a category was greater than 90% of the total, a value of high or widespread was assigned.
>
> If the fraction of material in a category ranged between 10% and 80%, a designation of significant was assigned.
>
> If the fraction of material in a category was below 10%, a designation of low was assigned.

Description of Water DROP

The Distribution Register of Organic Pollutants in Water (Water DROP) from which the observed data reported in the text was extracted is an interactive computerized data base of information about organic compounds identified as pollutants in all types of water (e.g., drinking water, surface water, industrial effluents, etc.) as described by Garrison et al, (1979). Information is being obtained from published reports, government documents, laboratory reports, and personal communications. For each occurrence, the data base contains a citation that includes compound name, Chemical Abstracts Service Registry Number (CASRN), sample water type, sampling method, sampling site, sampling date, analytical method, concentration detected, analytical laboratory, data quality indicator, and a reference to the data source. Citations can be retrieved on remote terminals by any one of the data elements. Water DROP is a part of the EPA/NIH chemical Information System (CIS) and is available to CIS subscribers all over the world.

This data base is still being developed and expanded. In January 1980 it contained 10,500 citations containing information about 1700 unique compounds. It must be kept in mind that the number of times that a substance is reported in Water DROP does not necessarily indicate its distribution in the environment; occurrence in Water DROP is influenced by whether or not and how extensively the compound was monitored for. Conversely, the absence of a compound from Water DROP does not guarantee its absence from ambient waters; the water may not have been analyzed by a technique that would have detected the chemical. In general, the potential for human exposure can be considered high for any compound reported frequently in Water DROP.

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